

TWILIGHT SLEEP

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AMNESIA AND ANALGESIA
IN PARTURITION
(TWILIGHT SLEEP)

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(TWILIGHT SLEEP)

BY

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AUTHOR'S NOTE

It is a great pleasure to have this opportunity to thank the German clinicians for their unfailing courtesy, and my attending physician, Dr. Gustav Seeligmann, for his kindness in allowing me to use the obstetrical material at the Lebanon Hospital. I desire to express my appreciation to the authorities of that institution and to its house staff and nurses for their assistance. Special thanks are due to Mr. Paul B. Hoeber, at whose request this book was written, for his help and many suggestions.

ALFRED M. HELLMAN.

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Compliments of the Author

INTRODUCTION

THIS little monograph had its origin in the desire of many of the author's medical friends to obtain a clear conception of the much discussed "Twilight Sleep." They seem to require a presentation of all the facts in one small book, as they have not the time to delve into the more than one hundred volumes that contain information on the subject. And this, the author understands from his publisher, is quite general among physicians. It is therefore hoped that this monograph will be useful to every physician whether he wishes to use Twilight Sleep or simply desires to advise his patients as to its value; for every medical man, no matter what his specialty, is overwhelmed with interrogations on this subject. In almost every instance the author

has gone to the original article. He has given a review of the contributions of importance on both sides of the controversy. He has delved into the German, Austrian, Swiss, Polish, English, Russian and French literature and has tried to give all the latest reports from Amerila, where most of the work is now being done.

The subject is worthy of a thorough study on the part of the medical profession and only after such study has the profession a right to reach a conclusion. However the lay agitation may be regretted, physicians must not be led into an attitude of opposition until that opposition is based on scientific data. If the study of the subject shows that Twilight Sleep is of greater or less value, then the profession must announce that fact to a public that will, in the last analysis, look to the medical fraternity for decision and advice.

The recent lay agitation for the relief of the pains of labor has reawakened in the

medical profession an acute interest in this subject and has led to the reporting of cases, experiences and opinions. All this emphasizes the fact that, ever since the introduction of ether in 1847, medical science has been steadily attempting to ameliorate these pains. Ether, chloroform, cocaine (local and intraspinous), opium, laudanum, chloral, antipyrine and other substances almost without end have been tried and either discarded, or relegated to their proper places for use in a certain few selected cases. More recently most of the work has been done with heroin, antalgine, morphine, and scopolamine (hyoscine) and more particularly with these last two in combination, in what is known as the Freiburg method of *Dämmerschlaf* (Twilight Sleep). Of course ether, chloroform, and even ethyl chloride still have their uses, with or without twilight sleep.

The author will deal almost entirely with the Freiburg method and simply touch on

its variations and the other methods now being recommended. For the present, and certainly for some time to come, the Freiburg method will remain of most interest, and until its proper value for American obstetrics has been finally decided there will hardly be opportunity to experiment with the other methods that are being suggested in such rapid succession. To this literature have been added a few theoretical considerations and a statistical report of sixty-six cases from the Lebanon Hospital. There are also added the result of a questionnaire answered by fifty American obstetricians and a bibliography of the articles used in making this volume, some references to closely allied subjects, and finally, there are four specimen charts used in conducting Twilight cases, which may be interesting as models.

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TWILIGHT SLEEP

I

HISTORY OF SCOPOLAMINE IN OBSTETRICS WITH A REVIEW OF SOME OF THE LITERATURE

THE first mention of the use of scopolamine and morphine in obstetrics appears in an article by von Steinbuchel in the *Centralblatt für Gynäkologie*, No. 48, 1902. In this article von Steinbuchel states that, stimulated by the work of Korff in surgery and Schneiderlein in psychiatry, he decided to try out the analgesic effects of these drugs in labor. The next year, while he was docent for gynecology and obstetrics in the University of Graz, he reported under the title, "Die Skopolamine Morphine Halbnarkose in der Geburtschilfe," the first twenty cases of labor in which these drugs were used in combination.

He obtained a diminution of pain but no anesthesia. He used very much smaller doses than had been tried in surgery. His greatest achievement was the inspiration he gave to others to make further experiments in obstetrics with this combination.

In his original article he set forth, as the basic requirements of any treatment given with the object of helping the mother, the following principles:

1. It must appreciably reduce the pain.
2. It must not stop the uterine contractions.
3. It must not contra-indicate the use of general anesthesia.
4. It must be safe for the mother.
5. It must not harm the child.
6. It must not cause post-partum atony of the uterus.

In his second article, in which he reported the first twenty cases, he outlined his treatment. He gave the patients one or two injections, at intervals of at least

two hours, of scopolamine 0.0003 (gr. 1/200) and morphine 0.01 (gr. 1/6). He used his preparations in solution, freshly boiling each one separately, and later had the combination of the two drugs put up in ampules. Of the twenty cases, only one remained entirely unrelieved of her pain, three were only partially relieved. In twelve cases the contractions were undisturbed. In two instances the intervals between the pains were lessened. Six times the intervals were lengthened, but the duration of the contractions remained unchanged. He had three cases of atony of the uterus, but they had received chloroform in addition to the other drugs. Vomiting was not increased. One nervous patient became excited for a short time. There were seven forceps cases, and two extractions of the after-coming head in breech presentations. Three times he had to dilate the cervix manually.

This is certainly a very high operative

percentage, but von Steinbuchel claims that in no case was the operation necessitated by the use of scopolamine. One child was born asphyxiated after a protracted labor completed by forceps. There were two still-births, one a macerated fetus and the other a hydatidiform. Later von Steinbuchel reported eleven additional cases without any mishap. He came to the conclusion that the mothers were frequently robbed of the memory of events that transpired during the action of the drug. There was no lessening of the contractions, and no poisoning of the child. In other words, the six requirements that he had laid down in his preliminary article, before using these drugs, had been fulfilled.

In 1904 Wartapetian, in his Inaugural Dissertation at Jena, reported his results in twenty cases. Certain of the cases received as many as five injections of scopolamine 0.00033 (gr. 1/200) and morphine 0.01 (gr. 1/6). Fifty per cent of the chil-

dren were born dazed. He ascribed this to the large amount of morphine he had used. The intensity and frequency of the pains were very little influenced but the suffering was greatly lessened, and he found the method safe for the mother.

Raining, in the same clinic, continued Wartapetian's investigations and reported on thirty-six cases. He made the first injection consist of scopolamine 0.0003 (gr. 1/200) and morphine 0.007 (gr. 1/9). This small quantity produced no results, and he then repeated the same dose of scopolamine, with double the morphine. All but three of the mothers were relieved. He found that some of the patients became very much excited. When using frequently repeated doses he found that the strength and duration of the pains were much lessened, but never to the extent of harming the mother or child. He saw no real complications during the labor. Only one child in this series was born asphyxiated. Dur-

ing the same year Weingarten reported forty-five cases from the University of Giessen. He gave only one injection of scopolamine, 0.0003 (gr. 1/200) and morphine 0.01 (gr. 1/6), but nevertheless found that in thirty-eight cases the pains were decidedly lessened and in six cases partially so. There were no delayed deliveries. In two cases the interval between the pains was shortened, and in sixteen the pains were steadied. Four of the children were born asphyxiated, but he ascribed this condition to causes other than the drugs. He saw no post-partum hemorrhages. There were four forceps cases and one version in no way caused by this treatment.

Ziffer reported thirty-one cases from the Landers Hebammen Schule, using the same dosage as Weingarten, having had his drug specially prepared. He believed that in one third of his cases the pains became less frequent and in some of them

weaker. He says, "This delay was so slight and so unimportant that it did not in any way disturb the labor." Five children were born asphyxiated with one death, the latter due to premature separation of the placenta. He did not believe that in any of these cases the asphyxiation was due to the scopolamine. The mothers certainly were relieved of suffering.

In 1904 Pushnig also reported on sixty-two cases he had observed. His drugs were prepared according to Ziffer's method, but he used scopolamine 0.0005 (gr. 1/120) and morphine 0.01 (gr. 1/6), seldom repeating the dose. The diminution of pain he reports as extreme in fifteen cases, great in forty-two, only slight in one and absent in four. He saw no harm from the injection. The uterine contractions were unaltered in thirty-six cases. They improved in thirteen cases out of nineteen in which the pains were weak at the time of injection. In two instances the pains were vari-

able. In five cases the contractions became weaker after the injection, but he did not believe this to be due to the drug. The third stage of labor was not lengthened. There was slight atonic bleeding in ten cases. There were eight still-births, and six babies were born asphyxiated, but so little did he blame the drug for these that he considered the method "a work of mercy."

Pisarzewsky, working in Poland, reported three cases. He used scopolamine 0.0003 (gr. 1/200) and morphine 0.0007 (gr. 1/95), repeated when needed. He noted a decided diminution of the suffering, but also a lessening of the contractions. All three babies breathed spontaneously. There was no post-partum bleeding.

Laurendeau, in 1905, reported in the *Presse Médicale* fifteen cases, in which he had used scopolamine 0.0014 (gr. 1/50) and morphine 0.014 (gr. 1/5). All of these cases were complicated, and operative

procedure seems to have been contemplated before the injections were even started. They finally required either forceps or version.

Müller, who reported in the *Monatshefte für Gynäkologie und Geburtshilfe* in 1906, used scopolamine 0.001 (gr. 1/600) and morphine 0.01 (gr. 1/6). He obtained analgesia and drowsiness. The contractions when influenced were benefited and he saw no complications when using fresh preparations.

Cremer, in a popular article entitled "Entbindung ohne Schmerzen," was the first to recommend the use of scopolamine and morphine in private obstetrical practice. He considered the treatment harmless when used with care. Later he twice reported in the *Aertzliche Vierteljahres Rundschau*. The 1908 report was based on 134 cases which were completed without harm to mother or child. He used scopolamine 0.0003 (gr. 1/200) and morphine

0.01 (gr. 1/6). This dose was repeated after fifty minutes and again in two and a half hours. Cremer also drew attention to the value of these drugs in eclampsia.

Bertino reported in *La Ginecologia*, volume IV, the use of scopolamine 0.0005 (gr. 1/120) and morphine 0.01 (gr. 1/6) in 400 cases. He obtained painlessness without disturbance of labor in 45% of his cases and saw no results in 36%. Thirty-eight times the contractions remained absent from seven hours to several days. In seventy cases he observed disturbances of vision, and brain symptoms which lasted sometimes for days. He found that the children were frequently apneic or asphyxiated. He did not approve of the use of this method. His report is not complete or satisfactory and it should be noted that he used larger doses than those recommended by von Steinbuechel.

It was about this time that Gauss, of

Freiburg, undertook the Steinbuchel treatment. He observed 300 cases and reported his results in the *Archiv für Gynäkologie*, 1906. This was the first of his now famous articles on this subject. He developed a technique which has become the standard and to which he applied the term *Dämmer-schlaf* (Twilight Sleep). He administered the combination of drugs in such a way as to produce not alone analgesia, in a certain number of cases, but also amnesia, in a very large proportion of them. Though realizing certain shortcomings in the method, Gauss was most enthusiastic about its eventual development. In this article he stated that he had seen in the literature reports of only 225 cases, although we find over 600 previous to his communication.

After discussing the justification for reducing labor pains when possible, he says that any method to be finally accepted must first of all cause a consider-

able reduction of the suffering of the mother, and any unpleasant effects which the method produces must be harmless. Furthermore, the unpleasant symptoms must be less objectionable than the pain which the drugs are alleviating. He gave the drugs at intervals, dependent chiefly on the mental condition of the mother and the strength of the fetal heart. Though von Steinbuchel had noted that some of the patients experienced a temporary loss of memory, he had looked upon this as rather a secondary effect of the treatment. Gauss came to the conclusion that though analgesia was most welcome whenever it occurred, it was the temporary loss of memory (amnesia) which would be the criterion of success.

His second contribution, entitled "Geburten in Künstlichen Dämmerschlaf," which appeared in the *Archiv für Gynäkologie*, Band 78, Heft 3, is probably the most detailed of his articles and deals

with his first 500 cases. He says that besides the two principles already mentioned, it is most important that the treatment should produce neither nausea nor other subjective disturbances. The regular advancement of labor must not be unfavorably influenced by a change in the uterine contractions or the abdominal pressure. There must be no harmful effect on the after-pains or disturbance of the nursing, or impairment of puerperal involution. The child must not suffer before birth. There must be no hindrance after birth to the establishment of the new functions either in the first weeks of existence or in the later development. In his earlier cases Gauss did not begin his injections until the labor had advanced so far that if any complications due to the treatment arose, the child could be delivered at once by forceps or some other not too severe operative procedure. From the very first he ruled out cases with primary weak

pains, narrow pelvis, placenta prævia and cases with a history of disturbances during the third stage of labor after previous deliveries. Later the contra-indications became less and only cases of primary inertia were excluded from this treatment. The 500 cases tabulated in this article were 68.3% of all cases confined at the hospital during this period. There were 233 primiparæ and 267 multiparæ. The average age of the former was 24 years, of the latter 30 years. There were 483 vertex presentations, six face presentations, four breech and seven transverse presentations.

As complications in these 500 cases Gauss gives the following table:

	Cases
Narrow pelvis	40
Hydramnios	5
Prolapse of the cord.....	4
Nephritis	2
Eclampsia	3
Premature separation of placenta.....	2
Placenta prævia	3
Habitual adherent placenta.....	1
Habitual post-partum hemorrhage.....	1

	Cases
Rupture of the cervix.....	2
Myoma of the uterus.....	2
Twists of the cord.....	1
Intra-partum fever	15
Pneumonia	1
Peritonitis	1

Four hundred and thirty-four of the 483 vertex cases were spontaneously delivered. Forty-nine were completed with forceps, fourteen for the sake of the mother, twenty-two for the sake of the child and the others because of a relative indication. There were four cases of subcutaneous hebotomy, also one classical and one vaginal Cæsarian section. There were four cases of version, one because of placenta prævia, one because of prolapse of the cord. In a case of twins, both babies were delivered by version on account of high fever in the mother. There were eight cases of version because of the transverse position. The breech cases progressed without help until that point was reached at which

practically all breech cases must be interfered with. There were forty-two minor operations performed, thirty of which were sutures of the perineum. In the third stage of labor the cavity of the uterus was examined four times to make certain that the entire placenta had been delivered. In three cases manual extraction was necessary, twice because of bleeding, and once because of habitual adherence and beginning fever.

Gauss attached importance to the particular preparation of scopolamine used. It must be remembered that this drug is rather an indefinite substance, and some authorities still insist that it is not pure, and that it may differ from the substance known as hyoscine. Gauss used either the powder or tablet, the important point being that he made his own solutions. He believed that the irregular effects noted by some observers were due in part to individual idiosyncrasies to the drug. He

saw seeming irregularities from injections made from the same solution, injected at almost the same time into different patients. Nevertheless he was very careful with his solutions and preserved them at an even temperature away from the light and moisture. The scopolamine and morphine were separately sterilized and only thereafter, if at all, made into one solution. He believed that with this care solutions could be kept for more than a year. The syringe that he used was always freshly sterilized and kept as free as possible from disinfecting fluids. The patient was carefully watched and the dosage arranged accordingly.

He described the action of the drug about as follows: shortly after the first injection the patient became tired and soon fell into a quiet sleep between the pains, from which she was aroused at each new contraction. Objectively the contractions are still painful, but subjectively the more

intelligent patients admitted that they were suffering little, if at all. Later, the patient became thirsty, had dryness of the mouth and throat, a redness of the face, a certain amount of twitching of the muscles, and sometimes restlessness. When very deep the pain is only objective, and noticeable by the peculiar facial expressions. Memory is still present. This is the state which all workers before Gauss attempted to produce. He went further and tried to abolish memory itself, so that the absence of the memory of all pain would be the final outcome. To obtain this he found it necessary to increase the dosage only slightly. Amnesia could not be produced in every case. Five or six per cent of his cases entered the hospital too late, and the only result from the injections in these cases was a quiet, restful sleep. When all was over, 18.2% of the cases were greatly relieved of pain during the labor, but did not reach the stage of amnesia.

Seventy-six per cent of his cases showed distinct amnesia. The picture presented by these patients in labor naturally varied. The greater number appeared sleepy but otherwise normal, every contraction arousing the patient with a slight sensation of pain. Every question was sleepily but correctly answered, and it was surprising to see that patients who seemed to have complete control of their senses were absolutely without remembrance of the labor when it was over. These patients were so nearly awake that one could hardly call it semi-narcosis. They were really in an artificial condition of sleep from which they could be awakened at any moment but of which they retained no memory. It was this new type of semi-narcosis which Gauss termed an artificial "Twilight Sleep." In the most successful cases where the patients were under to just the proper degree, they would say, "Thank God, it is all over," as the baby was finally expelled,

but a little later would not even know that the child had been born. Sometimes when her child was brought to her the mother thought it belonged to some other woman as she could not believe she was already delivered. The more intelligent who had been told in advance what was to be attempted were naturally overjoyed when they found that theirs had been a successful case. A very small number presented quite another phase. They were either in such a deep sleep that they could hardly be aroused or so restless and unruly that they could hardly be kept in bed. But none of these patients had any remembrance of the labor when it was over.

The value of this amnesia to almost all classes of patients cannot be doubted. It saves physical and mental suffering and removes fear in a succeeding labor. It is certain that these patients recovered more rapidly and with less general shock than did patients not treated with this method.

After a deep sleep following the scopolamine labor they awoke strong, refreshed and frequently ready to eat and act as if nothing unusual had occurred. When operative interference became necessary in these cases it could often be accomplished with little or no additional narcotics. There was no stage of excitement when general anesthesia was used after these drugs and the patient frequently did not know that a general anesthetic had been given.

The amount of scopolamine and morphine used was very much less than had been required in surgery. The lying-in woman is much more susceptible to drugs than other subjects. The dose must never be so large as to cause a cessation of activity in the expelling forces, for it is well recognized that over-dosage with these drugs would bring about such a result. Finally, deep narcosis in the surgical sense is unnecessary and undesirable. Various

doses were tried, sometimes scopolamine alone and sometimes with a greatly increased amount of morphine. The solutions were scopolamine 0.03% and morphine 1% and were used as long as they remained clear. The dose was varied with the general physical make-up of the patient. The largest dose was scopolamine 0.0036 (gr. 1/18) over a period of thirty-six hours, the longest case lasting fifty-seven hours, the patient receiving scopolamine 0.00375 (gr. 1/17) and morphine 0.03 (gr. 1/2). The technical difficulty lies in giving the patient sufficiently frequent injections of sufficiently small doses to keep her amnesic and still superficial enough to prevent harm.

As a result of the work of Link it was found that the Babinski reflex was one of the earliest signs of scopolamine action. The pupil reflexes were not much altered but muscular coördination was disturbed. The only reactions that Gauss found of

real use were sensibility of the pupil, the lack of muscular coördination, and above all, the memory test.

The meaning of amnesia Gauss discusses at length. The amnesia produced by scopalamine and morphine is not a loss of memory of previous events but is an inability to remember what is transpiring while under the influence of the drug. It seems that the drugs prevent impressions from being sufficiently imprinted on the brain cells to be held there, though they temporarily enter consciousness. Hence, Gauss deduced that, working in the reverse direction, he could tell from the depth of the amnesia the stage of the Twilight Sleep. After arriving at this conclusion he made his dosage almost entirely dependent upon the depth of the amnesia. In cases where a difference of language or extreme ignorance or dementia of the patient or any other reason precluded the use of the memory test, he resorted to

sensibility of the pupil and muscular co-ordination as tests. After schematically arranging the various reactions it was found that the spinal reflex was the best indicator of the beginning action of the drugs, but the ideal point to be reached was the state of amnesia which comes about the time that the spinal reflexes are lost.

This complicated explanation of the various symptoms shows conclusively that it is not always easy to keep the patient in just the ideal state; and that it requires the most careful and persistent watching on the part of the attending obstetrician and his assistants from the first injection to the completion of labor.

Gauss found that he obtained his best results when the patient was alone in a quiet room, away from all disturbing elements, with her mind at ease and a desire for Twilight Sleep. Even the crying of the newly-born infant was at times sufficient to

cause a disturbance in the amnesia, making it advisable to promptly remove the child to another room. Dark glasses and stuffing the ears of the mother were found to be a great help in preventing perception of light and noise. Sometimes the patient would only remember being transferred from the bed to the operating table, or her only recollection might be the actual birth. Such events seemed to be remembered more readily than was the sensation of pain whether produced by uterine contraction, abdominal pressure, forceps, or suturing the perineum. These isolated memories Gauss called "Islands of memory," and found that when they occurred too frequently during labor, the patient would reconstruct from them the entire course of labor. In this reconstruction she would be guided by her knowledge of labors in general, and by what she had heard during her awakening. It was sometimes very difficult to convince such pa-

tients that they had slept during most of the labor.

The complications which Gauss found in scopolamine labors he discusses under the headings of mother and child, subjective and objective. The annoying thirst he overcame by large quantities of water and never saw any resulting harm. Minor disturbances of hearing and sight, such as answering questions which had not been asked and seeing things which did not exist, caused no real trouble. Melanopia and hallucinations were likewise of little moment. The first and probably the most important matter discussed under "Objective Complications" was the lessening of the uterine contractions. He made notes on these contractions in 493 of his cases. In 451 of them there seemed to be no effect. Eight were decidedly worse after the injection and thirty-six were greatly improved. Schlimpert, who by means of schematic charts studied the contractions

for Gauss, showed that the pains were regulated, though the periods between them were frequently lengthened. The duration of the contractions themselves was also frequently lengthened.

The abdominal muscles were very little interfered with by the drugs. When the separate doses were sufficiently small the results were very good. When large doses were given the contractions of these muscles were at times definitely weakened. This was pronounced with morphine and much less so with scopolamine. That whatever decrease of the abdominal work did exist was of very little importance is shown by the comparatively small number of operations. In the entire series of 500 labors with its 506 deliveries, there were forty-nine forceps cases, nine versions (two of which followed vaginal Cæsarian), one abdominal Cæsarian and four hebectomies. This is an operative interference of only 12.6%, which is almost identical with

the operative frequency reported by Ploeger, in non-scopolamine cases at the University Frauenklinik of Berlin. Of the sixty-three operated cases thirty-seven were primiparæ and twenty-six multiparæ.

The average duration of these labors was sixteen hours and eleven minutes. This is well within the limit set by other observers for non-scopolamine cases. If in any particular case the labor is being unduly delayed by the use of the drugs, a rare occurrence, it is always possible to stop the treatment and allow the woman to press with the abdominal as well as the uterine muscles and complete the labor naturally. Nothing is lost by this; on the contrary the woman is spared a certain amount of pain during the first stage.

The expulsion of the placenta without help occurred in 56% of the cases. Credé's method was resorted to in 43%. In 0.6% manual extraction was employed. In the other 0.4% of the cases the placenta was

removed as a part of the operative interference. Gauss gives the frequency of manual extraction reported by twenty observers as ranging from 0.3% to 7.3%, thus definitely proving that it is not by any means increased by the use of these drugs. There were only twenty cases of bleeding beyond what could be noted as slight, and all these were in Credé's cases and were easily controlled by uterine massage.

Gauss carefully compared the milk secretion in 200 cases treated with scopolamine and morphine and 200 delivered during the same time without these drugs. He gives the following table, which speaks for itself:

	WITHOUT SCOPOLAMINE AND MORPHINE	WITH SCOPOLAMINE AND MORPHINE
Nursed of their own accord	137, or 68.5%	134, or 67%
Forced feeding ...	8, or 4%	15, or 7.5%
No milk	55, or 27.5%	51, or 25.5%

The involution of the uterus and its return to normal was not fully observed be-

cause most of the patients left the hospital about the seventh day. Late post-partum hemorrhages were never seen. Both clinically and experimentally Gauss established to his own satisfaction that the drugs in no way affected the kidneys. Phlebitis he noted in five of his cases, one of which had had the same complication in a previous non-scopolamine labor. Three of the five cases had undergone hebotomy. He had no maternal death under the treatment, nor as a result of it. There were no other complications in the mother. There were two cases of post-partum eclampsia, one of which had two convulsions before the treatment was started, and then another after her first injection, and no more.

The most common objection at present raised to this treatment is its supposed increased risk to the child. Of the 506 children (six twins) there were 500 (98.8%) living, six (1.2%) still-born. Of the 500, 306 breathed spontaneously, though

four of these were premature and died shortly after birth. One hundred and nineteen were born oligopneic, that is to say they took one deep breath at birth with more or less of a cry and then, despite movements of the extremities and regular heart action, their breathing ceased for a short period. When respiration was reëstablished it was at first very slow, but gradually became more frequent. In fifteen to twenty minutes at the most the child became normal and remained so. While the respirations were infrequent there would be some cyanosis between breaths, the eyelids would move, the pupils become somewhat dilated, and the child would appear extremely drowsy. In the larger number of cases this condition of oligopnea is due to the use of the drugs. With increased experience the percentage of oligopnea became very small, and no eventual harm resulted.

Sixty-five of the living children were

born asphyxiated. Forty-seven times this was definitely ascribable to conditions aside from the Twilight Sleep. In the eighteen remaining cases it was not possible to fix the cause, just as it is often impossible in non-scopolamine cases to definitely explain this condition. In some of them injections had probably been given too close to the moment of birth. Five of this series of babies finally died. One was passing meconium before birth and showed slow, irregular, feeble heart sounds. Two had aspirated large quantities of mucus and were born spontaneously before forceps could be applied. The fourth was in a narrow pelvis necessitating forceps application, and the child temporarily recovered to die the next day with cerebral symptoms. The fifth showed cerebral symptoms from the start, probably the result of forceps, and died after five hours. Of the five still-births, one was dead before the treatment was started, one

died intra-uterine as a result of placenta prævia and version, one died during a prolonged labor in a narrow pelvis because the fetal heart sounds were not sufficiently watched. The fourth case was due to version and a prolapse of the cord. The fifth was a breech case which went unobserved during the entire birth. After the body was delivered the head was held in the vagina as a result of several loops of cord about the neck. This case could have been saved had it been properly watched. In addition eighteen died between the third and fourteenth days, five from infection of the cord, ten as a result of prematurity, and three as a result of deformities. To learn whether the children of this series had suffered more than non-scopolamine cases Gauss compared these results with twenty-five hundred cases which had been delivered from 1895 to 1904 in the same institution, and found the comparison very favorable to Twilight Sleep. The

later history of the children, as far as it could be investigated, did not lessen the value of the treatment.

As a result of this work, Gauss came to the following conclusions: Twilight Sleep greatly lessens the suffering of the lying-in woman. This result is obtained without secondary unpleasant subjective symptoms, without appreciable influence on labor itself, and without danger to mother or child. In teaching institutions it allows vaginal examinations by students without annoyance to the patient. And finally he says: "The scopolamine and morphine Twilight Sleep in labor is a previously unattained method which promises great hope for the doctor, the patient, the teacher and the pupil."

Later Gauss and various of his students at Freiburg reported at length, adding nothing new, but emphasized the important points discussed above. Bruti, of Buenos Ayres, reported in the *Medizinische*

Klinik, 1909, 600 cases from Freiburg where he was then assistant. He made one additional interesting observation, namely, that the results were successful in 81% of the first class cases, 70% of the second class, and about 60% of the third and fourth classes.* He ascribes the better results in the first class to the fact that the patients were in a room alone, that they were treated by more experienced doctors and nurses, and that they received better care.

A series of 500 cases as reported in 1906 from so important a clinic as that of the University of Baden in Freiburg further stimulated work throughout Europe and America. The reports that followed did not all agree with Gauss's deductions.

Hocheisen, working in Bumm's clinic at

* In Freiburg "first class" corresponds to our private patients; whereas "second class" are more like our semi-private cases, and the third and fourth classes are ward patients.

the Charité in Berlin, and Steffen the following year gave emphatic expression of their dissatisfaction with the treatment. Probably on this account, and because of the prominence of Bumm, and despite some other favorable articles and Gauss's further report of 500 additional cases, the method was not generally adopted.

Hocheisen reported 100 cases. Forty of these were his own and the other sixty were attended by Bardeleben. He first reviewed the work of Gauss, and then considered scopolamine in its pharmacological aspect. He believed it to be a severe poison, dependable in its action. As part proof he quoted a gynecological death that had occurred at Budapest. The fatality was supposed to have been caused by a single injection of scopolamine 0.0003 (gr. 1/200). It is interesting to note in passing that Frigyesi, of Budapest, also reports this same case. He says that the woman, after having had a laparotomy performed in the

morning, was reoperated in the afternoon for a probable secondary hemorrhage. Three days later the patient died.

With this case in mind and because of possible dangers, Hocheisen believed that much smaller doses were necessary than those given by Gauss. His largest total dosage was scopolamine 0.002 (gr. 1/30) and only in one case more than morphine 0.02 (gr. 1/3). The patients were not isolated nor given the quiet that Gauss found valuable. Hocheisen did not use the spinal reflex or the memory test to ascertain the condition of the woman. He stated once in a discussion on this subject that the drug was given until the woman showed no more signs of pain. From this it will be seen that no matter what is said in favor of Hocheisen's work, the conclusion he reached proved nothing in respect to the Freiburg method, from which he wandered far. His work is simply a criticism of the value of these drugs as they were used in

Bumm's clinic. His results he reported as follows:

	Per Cent.
Absence of analgesia.....	18
Partial analgesia	21
Complete analgesia	61
Prolonged labor	50
Bleeding	5
Expression of placenta.....	4
Still-birth	1
Died after birth.....	3
Forceps cases	6
Extraction of fetus.....	1

In only six cases did he note amnesia. As complications he gives:

	Cases
Vomiting	6
Vertigo	2
Flushing of the face.....	60
Headache	6
Severe perspiration	2
Great restlessness	10
Hallucinations	4
Clonic twitchings	3

He admits that so far as the patient is concerned these complications do not amount to much; but to the observers who expect to see a painless birth and a deep sleep the impression is anything but pleas-

ant. He further says that in sixty-four of his cases the contractions were not influenced. Once they became more quiet and stronger. During the first period of labor they were weakened in twenty-one cases. During the second stage of labor the contractions were lessened in twenty-three cases, and in three they ceased altogether. The contractions of the abdominal muscles were lessened in 15%, very much lessened in 4% and increased in only 1%. As a result, 50% of the labors were prolonged. Even in the third stage of labor he had troubles which he ascribed to the drugs. He had five cases of atonic bleeding, in thirteen there was difficulty in releasing the placenta; four times it had to be expressed because of bleeding. He saw also fifteen cases of subinvolution, one case of severe dyspnea with nephritis of pregnancy, and one case of severe cardiac disturbance. One woman died from atonic bleeding, having lost $\frac{3}{4}$ litre of blood, the

death resembling that produced by injecting animals with scopolamine. Of the children, eighteen were born oligopneic, fifteen asphyxiated; one child died during delivery and three after delivery.

Of course with such results, Hocheisen objected very strongly to Twilight Sleep. Scopolamine is recognized as a dangerous drug when used in large doses, but the small doses needed in obstetrics are less dangerous than Hocheisen's results would lead us to suppose.

Lehman reported seventy cases in which he used scopolamine 0.0003 (gr. 1/200) and morphine 0.01 (gr. 1/6). As a rule two injections were sufficient but when a third was necessary it was given at least two hours later. His aim was always analgesia. This was a return to the method of von Steinbuechel, but he obtained very different results than did Hocheisen. In 61.6% of all Lehman's cases there was complete analgesia, in 37% partial, and in

1.4% the results were negative. The contractions remained unaltered in 58.7%, were improved in 25% and became weaker in 16.3%. He noted that some of the patients, probably because of absence of pain, used the abdominal muscles to greater advantage than before they received the injection. Others, because of the depth of the analgesia, hardly used them at all. The third stage of labor was not interfered with, there being but one atonic bleeding, in a case that had suffered from a post-partum hemorrhage in a previous non-scopolamine labor. He frequently noted an absence of after-pains. Lactation was normal. 13.3% of the children were born asphyxiated, 10% oligopneic, the remainder breathed spontaneously. One under-developed child died after two days, but Lehman does not ascribe this fatality to the drug. The other complications were negligible, and he concluded that the procedure was safe and valuable, giving warn-

ing, however, that it must be used only where the cases can be carefully watched.

Preller observed 120 cases. He tried to follow the technique of Gauss; his highest dose was scopolamine 0.0005 (gr. 1/130) and morphine 0.02 (gr. 1/3). He obtained amnesia in 70%, analgesia in 18%. In 12% the results were negative, chiefly due to rapid delivery. The contractions were favorably influenced in from 5% to 6% and unfavorably in from 24% to 25%. They ceased entirely in two cases. The abdominal contractions were absent in 25% and he believed this to be due to the comparatively large doses of morphine. He did not think that this visible lessening of the contractions was as real as might be inferred, but simply that the contractions went on so quietly that they were not fully observed; otherwise the labors would have been lengthened and the operative frequency increased. Seven and six tenths per cent of the cases required interfer-

ence against 8.4% in which the drugs were not used. Only twice did he remove the placenta by hand and there were only four cases of atonic bleeding, one of which appeared very late. He noted that frequently the maternal heart sounds were improved. In 20% of the cases, however, irregularity of the pulse developed and then the treatment was discontinued. Occasionally he observed considerable muscular twitchings. There were vomiting and vertigo in 8% of the cases and mild delirium in 5%. Two cases showed psycho-motor excitement, but the labors terminated normally, and after a deep sleep the mother awoke entirely refreshed. The scopolamine mothers, it was noticed, showed less post-partum exhaustion and only five complained of pressure of the head and heaviness of the joints. Only one child died, and that was in a case where the mother had fever. Five per cent were born apneic, 25% oligopneic. There

was no permanent harm in any case. Prel-ler concludes that as long as there is no more serious harm reported as a result of Twilight Sleep it must remain a clinical method for diminishing the sufferings of the mother, entirely justified if used with care.

The next important work which appeared upon the continent was by Steffen, who reported 300 cases. The first dose given by him was morphine 0.01 (gr. 1/6) and scopolamine 0.00045 (gr. 1/145), and no further injection was made until from three to six hours later. In general Steffen's total dosage was less than Gauss considered necessary. In 215 of his cases he gave no second injection. This was due either to the appearance of complications or because the labor was completed before he considered a second dose necessary. He claimed that the fetal heart sounds required constant watching, but that none of the other symptoms depended upon by

Gauss in controlling these cases were important. In most details he disregarded Gauss's technique. His reports were most encouraging, although he was not in favor of the treatment.

In 41.7% the results were favorable; in 52.7% unfavorable, and 5.6% of his cases remained uninfluenced by the drug. The contractions remained powerful in 56.1%, became weaker in 38.3% and stopped in 5%. They were improved in 0.6%. The suffering was unchanged in 18.6%, lessened in 35%, increased in 0.6%, and not noted in 45.8%. The use of the abdominal muscles remained good in 77%. Thirteen per cent of his patients were restless and mildly delirious and he ascribes to the treatment a certain number of lacerations. Atonic post-partum hemorrhage occurred in 3.3%. A few cases vomited. He used the forceps in 5.3% of his cases and believed that most of the labors were lengthened. Sixteen per cent of the children

were apneic and 2.3% were asphyxiated. Steffen concluded that the method of treatment did not secure the results desired, that it was not without danger, and could not be recommended in private practice. The spinal reflexes and the memory test on which Gauss placed so much stress were entirely ignored by Steffen.

Mansfield, who spent six weeks at the Frauenklinik in Freiburg, reports in the *Wiener klinische Wochenschrift*, 1908. He emphasized the need of individualization. He says there must be practically no attention paid to analgesia, and that all dependence must be placed on the memory test to regulate the dosage. If complete analgesia is accomplished there is great danger of over-dosage. The memory test when conscientiously used brings success without harm.

Bass, who considered the method useful, reported 107 cases with results which were much like Gauss's. He had an operative

frequency of 9.3% and claims that in only one case could the necessity of operation be ascribed to the drug. Nine of the babies were born oligopneic and there was one death which Bass ascribed to the injections. Four children were born asphyxiated after operative interference. There were three still-births in no way due to the drug. He felt that labor was often prolonged, but without harm to the mother or child. The uterine contractions and the third stage were seldom influenced but the abdominal muscles frequently became less active.

Geminder observed 100 cases. He did not strictly follow the Freiburg technique. He had good results in fifty-eight cases. The labor was uninfluenced in eighteen, and much delayed in twenty-four, of which eight came to a complete standstill. Operation was indicated in nine cases. Cyanosis and irregular pulse occurred in four of the mothers, atonic after-bleeding in five.

Fifteen of the children were asphyxiated, twelve oligopneic, and four died during the first week. He concluded that the treatment could not be recommended, and especially warned against its use in private practice.

Fabre and Bourret, in France, had two cases and were favorably impressed, both mothers having been greatly relieved without harm.

Matwjejew found that labor was not prolonged and the suffering was either absent or much relieved. The children were frequently born apneic, but he noted no other complications.

Kleinerts had 280 cases in which he followed Gauss's instructions. His largest total dosage was scopolamine 0.00585 (gr. $1/12$) and morphine 0.01 (gr. $1/6$). He obtained complete amnesia in 213, partial amnesia in thirty-four and in nineteen cases there was no amnesia. In fourteen cases there was no result because of rapid

delivery. He claimed that the contractions were unfavorably influenced if he made his injections too early and in too rapid succession. Except for thirst and dryness he saw no complications. In one case he discontinued treatment because of a severe cardiac lesion, but even here some relief had been afforded. In twenty-nine cases he used the forceps, but claims that not once was the indication brought about by the drug. In three cases the placenta was extracted manually. The puerperium was in no way influenced. Most of the children breathed spontaneously, though a few were born oligopneic and fewer asphyxiated. There was no death in any way ascribable to the drug nor did it cause any later harm to the children. His conclusions in his own words were: "The procedure is, in my opinion, only to be used in the hospital, and there only when a doctor and a well-instructed nurse have the time and patience to watch the case and to strictly follow the

rules. Under these conditions we have a method which, without noticeable influence on the labor, or danger to the mother, or harm to the child, does away with the apprehension of pain during the labor either entirely or to a very large degree.”

Mayer, in the *Zentralblats f. Gynäkologie*, reported fifty cases in which he followed the Gauss technique. His results were satisfactory, but he also came to the conclusion that the method should be used only in institutions where there were sufficient trained assistants to give the cases the close scientific attention required.

Dietschy, before trying the method at Basle, studied with Gauss at Freiburg. He found that the pains were weakened but that this in no way disturbed the labor. The children all did well and he found the method entirely satisfactory.

Avarrffy did not practice the technique he had been taught while a student at Freiburg. This probably accounted for the fact

that his results were less satisfactory than those of Dietschy, Mayer, Kleinerts and Gauss.

Frigyesi reported 200 cases from the Budapest Frauenklinik. He followed Gauss's technique but obtained only 62.5% amnesia. He ascribed this to the fact that so many of the cases resulted in such rapid delivery that there was time for only one injection. Taking into consideration only the cases in which several injections were given the percentage of complete amnesia rose to 80.7%. Analgesia without amnesia was present in 25%. There were dizziness and headache in 2%, slight excitement occurred in 7.5%. He believed that when the contractions were appreciably lessened the cause could be found in an overdose of morphine. As this is frequently difficult to avoid he finds it one of the few real objections to this method of treatment. Four of the children were born asphyxiated and thirty oligopneic. There was no ma-

ternal or fetal mortality. The puerperium proceeded uninfluenced.

Fehling reported in the *Strasburger medizinische Zeitung*, 1909. He had sixty-four cases with only 17% amnesia and hence was very little impressed with the method. He did not follow the Freiburg technique, and, as has been stated many times, amnesia cannot be expected if the memory test is not properly applied.

Bossé, in conjunction with W. Eliasberg, in the *Sammlung klinische Vorträge für Gynäkologie*, 1909, reported 122 successful cases.

Reports in less detail and of less importance were also made by Hold, Klein and Berger. Their results were in the main very satisfactory.

Shortly after Gauss's original article appeared, the treatment was tried in many parts of the world, notably in England and America, and will be reviewed in other chapters.

From about 1909 until recently very little has been heard on the subject except from Freiburg, where Gauss, inspired by his chief, Prof. Kroenig, continued with the technique he had devised, so that to date he has had over 6,000 cases of Twilight Sleep, and is more than ever convinced of the value of the method and enthusiastic over his results.

Since October, 1914, American medical literature has been abundantly supplied with articles on this subject. These will be discussed in a separate chapter.

The literature here summarized and tabulated shows that the mother is always safe and that where the dosage is not recklessly high the infant is also unharmed. Dangers arise only as a result of neglect. These cases need the greatest of care and attention. Annoying complications can arise, but these are reduced to a minimum by experience and strict adherence to Gauss's technique.

II

THE FREIBURG TECHNIQUE OF TWILIGHT SLEEP

LET us consider the details of the Freiburg method of Twilight Sleep as we should apply it here in America.

In preparation the physician must fully acquaint himself with what he expects the drugs to do, study the literature, and if possible see a few cases treated by some one who has had experience with the method. The obstetrician must be familiar with the condition of the patient, her measurements, and the position of the child. When labor starts the patient must be placed in a quiet, darkened room. Dark glasses, or a cloth over the eyes and plugging the ears are helpful in producing the necessary external effects. There must be plenty of doctors and nurses at hand to

assist, and a supply of the usual paraphernalia for instrumental child-birth—sterile linen, forceps, and so forth.

When the labor pains have increased in force so as to produce at least two fingers dilatation of the cervix, and recur regularly every five or six minutes in primiparæ, and not less than every seven or eight minutes in multiparæ, we are ready for our first injection. This is all important, for primary inertia of the uterus is the one contra-indication. The first injection should consist of morphine hydrochloride gr. 1/4, and scopolamine hydrobromide gr. 1/150. From this moment the patient, and especially the fetal heart sounds, must be carefully watched. As a rule after fifteen or twenty minutes the patient will be quiet between pains, and may even sleep. During the pains she will probably still complain, but slightly less than before the injection was made. From forty-five to sixty minutes after the first

injection, if all is well we are ready for the next hypodermic. All succeeding doses consist of scopolamine alone, the usual amount being gr. 1/450. From now on time plays no rôle whatever. My own experience, however, has shown that succeeding injections are required every thirty minutes to two hours—the intervals becoming longer as the number of injections increases. The fetal heart, the mother's pulse and general condition must be carefully watched and the memory test applied every ten or fifteen minutes. What we wish to discover is the stage at which the woman's memory for present events is absent but on the verge of returning. This memory test is the most exact method we have for determining the depth of the anesthesia. It is most easily made by showing the patient some object, by catheterizing her if this is indicated, or by taking the temperature, and a few minutes later pretending to repeat the act. If on inquiry

the patient has no remembrance of the previous act she is sufficiently under the influence. If at the end of a uterine contraction during which the patient showed signs of pain, she is not aware that it has taken place, this too shows in a definite way that there is loss of memory. If all is well then the slightest sign of returning memory means that another dose of scopolamine must be given. The number of doses administered is of no importance. Over twenty injections have been reported in an individual case without harm. Three to seven injections suffice in the ordinary labor case.

If the patient is only slightly under the influence, or on the verge of coming out, then any unusual noise, or a flash of light, or other external stimulation, may cause the memory of that event to persist. The increased pain at the moment of delivering the head may act as another such stimulus. This must be guarded against by the dos-

age and depth of anesthesia, or by the addition of a few drops of some general anesthetic. These little awakenings of the memory have been termed by Gauss "islands of memory," and as elsewhere stated, if too many of these islands exist in any particular labor, the patient may mentally reconstruct the entire course of labor, and not believe that she does not remember every moment in the process of birth. Thus, as far as she is concerned, the case has been a failure.

There are other points of importance to be watched besides the fetal heart, the mother's pulse and the amnesic condition. The general progress of labor must be observed. The dryness of the throat must be overcome by giving the patient frequent drinks of water, even though they are not asked for. The bladder must be catheterized because the analgesia existing is apt to cause the mother not to perceive its distention. Muscular coördination will

early be absent and the pupillary reaction to pain will become less active as the sleep deepens. The small vessels of the face will dilate, causing flushing as a very early symptom.

The first stage of labor will rarely be lengthened by this procedure. On the contrary, it may be shortened. The second stage is recognized by most observers as requiring a little longer time than in non-scopolamine cases. I believe that most of this delay takes place after the head has reached the perineum. The length of time that it remains there is of itself not important. Twilight Sleep observers have definitely proven that the old teaching that forceps must be applied when the head has been on the perineum an hour and a half to three hours, is incorrect; and a delay at this stage of six to eight hours or even longer, will be absolutely harmless, if the fetal heart sounds remain good.

If the mother does not use the abdominal

muscles as she would have done without scopolamine, it is frequently possible to suggest, without awakening her, that she bear down. Often a small dose of pituitrin* will complete the labor. It is certainly not difficult for the obstetrician to apply forceps at this stage, provided the treatment has not been started until the cervix is at least two fingers dilated and the head engaged. If an emergency arises the labor can always be rapidly brought to a conclusion by manual dilatation and application of instruments. If the fetal heart sounds should become decidedly slower (below 100), or much more rapid (above 170), it is always best to discontinue further treatment, and if then the fetal heart does not return to normal we should complete the labor as above suggested.

As soon as the child is born it should be removed to another room, for the outcry

* Pituitrin frequently does not work as powerfully as when scopolamine and morphine have not been used.

of the infant might produce one of the islands of memory which we are trying to prevent.

In my experience one of the most unpleasant complications is the restlessness which may arise. In the extreme cases this is characterized by the patient throwing herself about, and with tremendous strength attempting to get out of bed. This in itself will not effect the end result of the Twilight Sleep, for the patient will not be aware when she awakes that she has not been quiet the entire time. It does, however, cause difficulty in preserving asepsis, and can only be overcome by a large number of assistants. In two of my cases at the Lebanon Hospital we discontinued the treatment because we could not control the delivery aseptically. This does not contra-indicate the method. The worst that can be said about it is that when there is not sufficient assistance we must discontinue the injections and allow the case to

be recorded as one of only partial amnesia. With continued practice, a proper application of the memory test, and correct judgment of the depth of the "Sleep," restlessness becomes less frequent and will only exist when there is a distinct idiosyncrasy to scopolamine.

The child having been removed to another room is treated in the usual manner. After a little experience, it is surprising how seldom oligopnea and asphyxia arise when the labor has progressed normally. If there is an oligopnea the infant may cry out once, and then with a regular but slow-beating heart it will refuse to breathe, and become more or less cyanotic. Left to itself, I believe that in all cases the condition will gradually disappear and the infant return to normal. Nevertheless, one ought to resort to the usual methods of resuscitation, for these will naturally hasten breathing. Asphyxia occurs just as often in non-scopolamine cases and, I be-

lieve, is never caused by these drugs when they are properly used.

While the baby is being thus attended the mother must be carefully watched. Though atonic post-partum bleeding will not occur more frequently than in ordinary deliveries, when it does occur the patient will not draw attention to it, and hence must be observed for this contingency. On account of the slow dilatation of the vaginal outlet there should be few lacerations of the perineum. They can be sutured as usual, either with or without general anesthesia, depending on the depth of the scopolamine narcosis.

Everything being completed, the mother will fall into a deep sleep lasting from half an hour to six hours. From this she will awaken without exhaustion, and greatly refreshed. The puerperium will be entirely normal, the flow of milk undisturbed, and involution satisfactory. Nausea and vomiting are almost unknown, even when

chloroform or ether have been used, because the quantity required will have been so small. Headache will occasionally be noted, but this too will rarely cause annoyance. The only post-partum complication that I noted was an annoying herpetic eruption of the mouth and throat, from which a very few cases suffered. This I believe can be entirely avoided by giving water freely. In successful cases the mother will be less exhausted and will more rapidly regain her strength than in cases where scopolamine has not been used. From this point on no complications will arise in mother or child in any way ascribable to Twilight Sleep.

Though this treatment is used at Freiburg only in the hospital, there is no reason why it cannot be carried out in the home. It simply requires the dark, quiet room, the usual paraphernalia, the exclusion of all members of the family and friends, and the constant presence of the

obstetrician with plenty of assistants.

The only absolute contra-indication to the use of Twilight Sleep is primary inertia. Contracted pelvis, dry labors, rigid cervix, eclampsia, cardiac disease are not contra-indications. In the higher degrees of contracted pelvis operative interference will have been arranged for before the injections are started.

III

CONTROVERSY BETWEEN FREIBURG AND BERLIN

THE controversy between Freiburg and Berlin became so prominent because of the vast difference of opinion between two such important clinics as those of Kroenig and Bumm. Possibly Twilight Sleep would have been generally adopted as a result of Gauss's favorable report, had it not been that Bumm's Berlin Clinic, then the foremost in Germany, so soon after expressed such an opposite view of the entire matter. The controversy was simply an interchange of opinions as to the value of scopolamine and morphine administered in combination during active labor, and as to the method, dosage and technique of administration. Gauss's original article, with the report of 300 cases, was more detailed and

more exact, more scientific and above all much more enthusiastic than anything that had gone before. Because it had developed a definite technique based on certain scientific tests, it was the very beginning of the modern view of Twilight Sleep. Following the courageous lead of von Steinbuchel, others had experimented with scopolamine and morphine in labor, but only with the hope of producing analgesia. Gauss practically started where Steinbuchel left off. He developed the method of administering small doses, repeated as frequently as required, to keep the patient in a state in which there was loss of memory for passing events.

Gauss's enthusiastic article in 1906 was soon followed by Hocheisen's unfavorable report. Gauss answered the criticisms of his method which, it will be remembered, Hocheisen had so entirely disregarded. At this time, and as a part answer, Gauss reported in detail his first 1,000 deliveries

with scopolamine and morphine. It is not necessary to review this report at length, for it only showed, as was to be expected, that Gauss's new statistics merely improved upon his original work. He discussed the reasons for Hocheisen's failures, showing that, though some of them were due to the poor solutions used, the greatest trouble came from not having followed the rules that Gauss had deduced from his own painstaking work.

After reading the reports of both Hocheisen and Gauss, we must feel that the latter's work was much more thorough and careful than that of the former. In the first place Gauss reports many more cases, and practically all of them were conducted under his supervision, while Hocheisen saw only forty of the 100 cases he reports, and these forty with an eye to analgesia rather than to amnesia. Gauss concludes his article in which he reported the 1,000 cases with details of his last 500 cases.

One mother died following operative bleeding in a deformed pelvis. Twenty-three of the mothers had a definite cardiac condition, which, according to Gauss, was helped by the treatment. This was in direct contradiction to the observations of Hocheisen and Steffen. Gauss measured the post-partum bleeding in 363 cases and found that in 92.8% it was entirely physiological, in 6.3% it was less, and in only .9% was it above the normal. In no case did it threaten life. The third stage was not effected, and in only 1.7% of the 1,000 cases was there a subsequent morbidity. In his first 500 cases he had used forceps in 9.68%, but in the latter 500 this was found necessary in only 4.95%. The oligopnea decreased to 12.7% and the asphyxia to 6.3%. The fact that there were 3% less fetal deaths than in non-Twilight cases is explained by Aschoff, of Freiburg, on the ground that the slightly delayed breathing worked favorably, by preventing inspi-

ration before the head was fully born, thus preventing aspiration of fluids. Gauss concludes his article with the repetition of the rules he had before laid down, and emphasizes the value of the memory test, saying, "On the proper use of this test depends the success of the method." Hocheisen reported no further cases. He did, however, attempt to answer Gauss, and in a discussion on Twilight Sleep, in Munich, he reiterated the views he had previously expressed.

Steffen strongly supported Hocheisen, but the report which he published for the purpose of casting discredit on Gauss's work proves, it seems, rather that Gauss developed the best results through his untiring efforts and adhering strictly to his own technique, which the others had ignored. It will be remembered that Steffen gave two-thirds of his cases only one injection, and yet he gives one the impression of actually doubting Gauss's figures,

possibly believing that it was enthusiasm that had led Gauss to favorable observations, where an unbiased observer would have reached other conclusions.

Despite further enthusiastic articles by Gauss and Kroenig and favorable reports from various parts of the Continent, as well as a few from England and America, the method did not come into general use. This may be explained partly by the fact that Twilight Sleep requires much time and attention on the part of the obstetrician and his assistants, and surroundings that are very difficult to obtain in large institutions. But the fact that Twilight Sleep was not more widely adopted must be ascribed chiefly to the unfavorable reports of Hocheisen and Steffen. Hocheisen was virtually speaking for his chief, Prof. Bumm, who was then in charge of the Frauenklinik at the Charité in Berlin, and was generally recognized as Germany's foremost obstetrician. Gauss and

Kroenig had so much faith in their own conclusions that they were not hindered by this antagonism, and continued their technique, so that up to the present writing they have had over 6,000 successful Twilight cases.

In the tenth edition of Bumm's "Grundriss zum Studium der Geburtshilfe," he says in regard to this matter: "Recently there has again been used the subcutaneous injection of narcotics in the form of a combination of scopolamine and morphine, whereby, as has been shown by Gauss through many observations at the Freiburg clinic for women, there can be produced for many hours during labor a sort of Twilight Sleep, so that the conscious sensation of pain almost disappears and there remains for the woman only slight memory of the course of the labor. Everything depends on the correct dosage. The treatment begins when the pains are pronouncedly strong and regular, with

morphine 0.01 (gr. 1/6) and scopolamine 0.0003 (gr. 1/200). By means of repeated injections of scopolamine 0.0002 to 0.0001 (gr. 1/200 to 1/600), which are given according to the condition of the woman, the Twilight Sleep is brought about and maintained. Too strong doses can produce a diminution in the strength of the pains, or their entire cessation, and thereby delay the labor hours or days. The method requires not only much practice and experience on the part of the doctor, but can only be undertaken when the doctor can continuously remain near the patient. It is contra-indicated in abnormal labor conditions and diseases of the woman. Since the children are not infrequently born in a condition of somnolence, in which the breathing is delayed or stops entirely, they, too, require careful watching."

IV

CHEMISTRY AND PHARMACOLOGY OF SCOPO- LAMINE

EVERY phase of the action of morphine is too well known to all practitioners to require discussion here. There has always been so much controversy over scopolamine and hyoscine that a few words regarding these drugs will be timely.

Though the last edition of the *United States Pharmacopœia* considers hyoscine and scopolamine identical, many textbooks on materia medica claim that hyoscine is dextrorotatory, and therefore less powerful and less reliable than scopolamine, which is levorotatory. They are generally known as belonging to the belladonna or atropine group. Scopolamine is

an alkaloid obtained from a number of different plants, the most common of which are *Hyoscyamus albus* and *Hyoscyamus nigra* and *Scopolia carnioca*. Scopolamine is slightly soluble in water. The hydrobromide salt, which is the form generally used, crystallizes in rhomboids, which are likewise soluble in water and alcohol, sparingly soluble in chloroform, and insoluble in ether. It has a bitter, acrid taste and is acid to litmus. It is slightly efflorescent and when ignited leaves no residue.

It is very difficult to isolate scopolamine, and some of the early variable results with the use of the drug may have been due to impurities from which it had not been entirely separated. Though Reichardt and Hohn discovered the drug in 1871, it was not until much later that scopolamine and hyoscyne were proven to be identical.

The preparations now on the market all presumably comply with the standards of

purity of our *United States Pharmacopæia*. The purity can be tested as follows: Add sulphuric acid and, if there are no carbonizable impurities present, the solution will remain colorless. The absence of morphine is proven when the subsequent addition of a drop of nitric acid likewise produces no color. The chemical formula is $C_{17}H_{21}NO_4$.

Scopolamine dilates the pupil more rapidly than does atropine, but its effects in this direction seem to be short-lived. The heart, and therefore the pulse, are slow, as is the respiration. It produces sleep by numbing the sensory areas in the brain. Few sensory impressions are received, consciousness is lessened and hence sleep produced. In fact, the action on the entire brain, in the average case, as well as on the entire system, is what is ordinarily termed "depressing." In rare cases it causes dizziness, restlessness, excitation and possibly delirium. It is excreted by the kidneys

and found in the urine, but all trace of it disappears from the system in twelve hours. Over-dosage shows itself in extreme dryness of the mouth and throat, dilated pupils, dry red skin, rapid pulse and breathing, a wild, talkative delirium and extreme restlessness. It is generally administered hypodermically, the usual dose being from 0.0003 (gr. 1/200) to twice that amount. In obstetric practice smaller doses are given and repeated when necessary.

Gertrude Slawyk, who wrote her medical thesis at Freiburg in 1912, on the chemistry and pharmacology of scopolamine, claims that scopolamine quiets the cerebral centers so that in about ten minutes after hypodermic administration there are drowsiness, heaviness of the eyelids, semi-unconsciousness and then sleep. It may cause dizziness, rarely nausea, itching, sensation of warmth, reddening of the face and a sour taste; and when large doses are

given it may cause delirium. The sleep produced is deep and quiet. It is difficult to awaken the patients and more difficult to rouse them to complete consciousness. The deepest sleep is supposedly in the first two hours and with it comes the slowing of the pulse and respiration. Finally there is an almost physiological sleep, lasting from six to ten hours, from which the patient awakes slightly benumbed but rested. Slawyk does not discuss the condition of the eyes. She says the circulation is moderately slowed, but otherwise not altered, the blood pressure is temporarily raised and the respiration slowed. The kidneys do the work of excretion, but some of the drug traverses the placenta and affects the child in utero. The gastro-intestinal tract suffers only a diminution of secretion. Repeated large doses of scopolamine, greater than have ever been used in obstetrics but which may be employed in neurological conditions, may cause cacosia. It is

impossible to state the exact toxic dose, as the individual's reaction to the drug is most variable. Though large doses of it may be poisonous, it is certainly safe when used in the small doses required in obstetrics.

All earlier writers mentioned the fact that the drug rapidly deteriorates, and it remained for Straub, also of Freiburg, to make a stable solution of the preparation. He discovered that mannit, a sugar of the sixth degree, acted as a preservative for scopolamine and that a 10% alcoholic solution of mannit was the most convenient form for the purpose. In this solution the drug remains therapeutically active over a period of years.

Recently Lieb, of Columbia University, stated that scopolamine is found in the mother's milk for several days after administration, but the author has not been able to find any confirmation of this statement. The retinal signs in the infant due

to the scopolamine pass away more rapidly than would be the case if the baby were continuing to get scopolamine with its milk.

V

FURTHER REVIEW OF THE LITERATURE WITH SPECIAL REFERENCE TO TWILIGHT SLEEP IN ENGLAND

IN Great Britain, as elsewhere, scopolamine and morphine were used in obstetrics by various observers shortly after the appearance of the original work of Kroenig and Gauss. Despite the fact that these observers were thoroughly familiar with the German work, as shown by their own writings, not one of them seems to have scrupulously followed the Freiburg technique.

Buist, of Dundee, reviewed the work of Gauss and other Germans in great detail in an article published in 1907, and concluded from his own observations in sixty-five cases that though there is the risk that the procedure may prove annoying in indi-

vidual cases, the picture is a very satisfactory one. In most cases alleviation of pain was achieved. In one case where the labor seemed to have been stopped by the drug, though the patient slept all night, the os was entirely dilated by morning. He does not believe that the treatment can be held responsible for any cases of atonic bleeding. He believes that though over-dosage produces possible dangers this can be avoided by careful watching.

Corbett reported twenty cases. He seems to have confounded amnesia with analgesia. He used larger doses than Gauss recommended, and combined the scopolamine and morphine with other drugs. The memory test was not used by him, and his deductions though interesting are of little value regarding Twilight Sleep as we now understand it. He draws the following six conclusions:

1. Scopolamine and morphine are of great use in cases of hysteria in the first

stage, but should be avoided in the second stage when possible.

2. There were no ill effects to the mother from repeated doses.

3. There were no ill effects to the child from repeated doses, provided the child was not born until at least four hours after the last injection.

4. Apnea is due to the morphine.

5. The apnea is best overcome by hot baths.

6. Strychnia may help in counteracting the ill effects of the drugs.

Cotterill, who has been quoted in some of the later literature on this subject, does not, as far as can be ascertained, mention the use of these drugs in obstetrics. He limits his remarks to a discussion of repeated injections given previous to surgical operations.

Croom, who in 1908 reported sixty-two cases, wandered far from the Freiburg technique and tried almost entirely for

analgesia. He came to the conclusion that the treatment acted (1) as a soporific, (2) as a narcotic, leading in some cases to complete anesthesia, and (3) as a possible amnesic. In the discussion of this report Hattain and Ferguson claimed to have been using the drugs for about eighteen months, with satisfactory results, but they gave no details.

Innes, in 1912, said that he had been using the drugs for two years, and found them "most efficient in soothing the pains of labor," but he came to the rather peculiar conclusion that only one dose should be used, stating that if beneficial results were not obtained thereby, further injections were useless, as well as dangerous; useless because a patient who was not helped by the primary injection showed that her system could not be properly influenced, and dangerous because repeated injections might injure the child.

Giuseppi, in a lengthy article in *The*

Practitioner for 1911, reports that in six cases he used hyoscine gr. 1/100, morphine gr. 1/4, and atropine gr. 1/150. In ten cases he reduced the morphine to gr. 1/6, and the atropine to gr. 1/180. In twenty-one cases he again gave morphine gr. 1/4 and omitted the atropine. He tried very hard to individualize his cases and he repeated the hyoscine when he considered it indicated, but he never gave more than one dose of morphine. The dosage of hyoscine was much larger than Gauss advised, and instead of using the memory test to decide the need of repeated doses he waited until he saw that the patient was awakening. He says that he attempted to produce, not unconsciousness, but a Twilight Sleep, from which the patient could be awakened at any moment without recollection of what had occurred in the meantime. In six (16.2%) of his thirty-seven cases analgesia was complete; in ten (27%) it was marked; in fourteen (37.8%) it was decreased, and

in seven (19%) there was none. One of these last seven cases was very excited before treatment began and remained so even after two injections. In two of these seven delivery was too rapid for the treatment to be of any value. He states that seven of the patients did not know of the birth of the child. Eleven multiparæ claimed that they had very much less pain than in their previous labors. In one case a partially adherent placenta was manually removed without any anesthetic and with very little discomfort. In several cases of perineal suture there was little or no pain. Twenty-nine of his cases slept between contractions; four became excited. There was flushing of the face in almost every case and there was frequently dilatation of the pupils. He noted no severe thirst and no change in the maternal pulse. He states that the difficulty in measuring uterine contractions accounts for the difference in the views as to how these are influenced by

Twilight Sleep. The woman, he says, certainly does not bear down as strongly as normally, probably on account of drowsiness and diminished reflex action. The third stage he did not find altered. Six of his children were born in what he terms "a slight condition of blue asphyxia." Two of them could not be revived. In one of these the fetal heart was faint throughout labor and in the other the membranes had been ruptured twenty-seven hours before birth. In four other cases, the fetal heart was found on auscultation during labor to be weak or irregular. Forceps were immediately applied, but two of the children were born dead. The after-effects on all the mothers were entirely satisfactory, and he noticed no later effects on the child. He reached the following conclusions:

1. The result to be obtained is amnesia.
2. That it is an efficient means of controlling pains and practically safe when proper precautions are taken.

3. There is danger to the child unless the fetal heart is carefully watched.

4. The course of labor is not altered.

* 5. The repetitions of the injections must be regulated by the amount of suffering.

6. The morphine should never be repeated.

7. Solutions must be freshly prepared.

† 8. The dosage is hyoscine hydrobromide gr. 1/100 and morphine sulphate gr. 1/4.

Solomons and Freeland, working at the Rotunda, in Dublin, tried the procedure in 100 selected cases of primiparæ. The treatment was started with scopolamine gr. 1/500 and morphine gr. 1/4. After the earlier cases they used scopolamine gr. 1/120 and morphine gr. 1/6. They secured complete analgesia in ten, marked in fifty-seven, fair in twenty and no analgesia

* We are now all convinced that the repetition of the drug must depend on the memory test alone, provided the mother and baby are doing well.

† Everyone to-day would consider this too much hyoscine.

in thirteen. Of these last, four vomited the medicine and eight received too small a dose. They did not try for amnesia and they did not believe it necessary to keep the patient in a dark, quiet room. They found that labor was prolonged, but there was no danger to mother or child, and that it was safer to give the drug by mouth.

Before the British Association of Registered Medical Women, Constance Long reported on fifteen selected cases, and concluded from these that the method was safe for both mother and child. In the discussion following this report, Mrs. Meakin Haarbleiden told of her visit to Freiburg and of the favorable impression received.

Dr. Spencer Shill, in 1910, reported nineteen cases and said that these had given him great satisfaction. Though much encouraged he was not yet prepared to give definite information on its safety and value. During the discussion Prof. Albert

Smith reported one case with complete analgesia.

Halpern and Brooman, in 1909, reported 100 cases from Winnipeg. They reviewed the continental work and also some animal experiments. They were very well satisfied with the procedure, and found that it produced amnesia and analgesia without delaying the labor or causing any danger to mother or child, but that it required hospital care and detailed watching.

Before the Obstetrical and Gynecological Section of the Eleventh Congress of Russian Physicians, Iljin reported sixty-seven cases, and said that the treatment produced painlessness, with only a slight lengthening of labor and very little danger. Brodsky, of Moscow, reported 200 cases; Trabscha forty; and Nejelow sixty; but the details of their work do not appear in the literature.

The study of the above certainly shows that most of the men working outside of

Germany were giving scopolamine and morphine and obtaining satisfactory results, but were in general not giving Twilight Sleep according to the Freiburg technique. Giuseppi was the only one who tried to obtain amnesia, and he did not use the memory test as a guide for repeating the injections. The others were satisfied with more or less analgesia.

VI

TWILIGHT SLEEP IN AMERICA AND RESULTS OF A QUESTIONNAIRE

SHORTLY after Gauss's original work appeared, Newell, of Boston, reported before the American Gynecological Society his investigation of Twilight Sleep in 123 cases. He finally gave up the method, fearing that it possessed certain inherent dangers, and because too many of the babies were born asphyxiated. He did not adhere to the Freiburg technique. McPherson also used Twilight Sleep at that time, but abandoned it after a short trial. Both of these men have within the last year again experimented with the method.

In connection with these reports must be mentioned the work of Butler, who in 1907 gave a very extensive review of the entire

subject. Most of his work dealt with scopolamine in surgery rather than in obstetrics. He reported no cases of his own. At the same time Birchmore, of Brooklyn, used hyoscine gr. 1/100, morphine gr. 1/4 with cactine. He did not use the Freiburg method and tried only to quiet the pains. He found that this combination "stripped motherhood of its horrors." He seems to have been very successful in producing analgesia without doing any harm, and has recently stated that he still uses this method.

Since the summer of 1914 there has been, here in America, a great revival of interest in this subject, and the literature on Twilight Sleep is continually growing. It seems to me unfortunate that all of the present investigators are not adhering to the Freiburg method in every detail. This may be accounted for in several ways. American hospitals are not as well supplied with trained midwives and resident

physicians as are the European clinics. Furthermore, not all streets on which hospitals are located are as noiseless as Albrecht Strasse, where the Freiburg Frauenklinik is located. And, probably, most important of all, we are not able to have our Kroenigs ten minutes away from the institutions and our Gausses living in them. Hence it may become necessary to adopt a method which is less difficult of manipulation, even if less successful, for alleviating the pains of childbirth, than the Freiburg method. Nevertheless, we should make every effort to attain the successes of Freiburg along the lines advised by the masters at that place. In other words, we should try to obtain amnesic deliveries with or without analgesia, and we should use the memory test to decide the necessity of successive small doses of scopolamine.

In September, 1914, Arluck and Rongy reported 100 cases, obtaining 83% amnesia, 8% analgesia and 9% failures.

They concluded that such a method, which instils confidence in the patients, is worthy of and must be given a fair trial.

In the October, 1914, *American Journal of Obstetrics*, Rongy further discusses the topic, adding twenty-five cases, and concludes:

1. Standard solutions are essential.
2. Cases must be individualized.
3. The patient must not be disturbed.
4. A nurse or physician must be in constant attendance.
5. The method should be applicable in well-regulated private homes as well as in hospitals.
6. It does not affect the first stage of labor, but the second stage is somewhat prolonged.
7. Pain is markedly diminished in all cases. Amnesia is present in the greatest number.
8. The treatment does not interfere with other therapeutic measures.

9. The fetal heart sounds must be frequently watched.

10. Oligopnea was present in 15.2% of cases. It caused no permanent ill effects.

11. The puerperium was not affected.

In the same issue Harrar and McPherson report 100 cases from the Lying-in Hospital of New York, and conclude that it is a valuable method of causing amnesia in from 60% to 70% of cases, and that it is safe in painstaking hands when the prescribed technique is followed.

The same magazine for December has a detailed article by Knipe. He reviews the literature, gives the details of the technique and dosage and reports his own experiences in forty-one cases. Knipe very enthusiastically and strongly favors the general adoption of the treatment.

Polak, in the *Long Island Medical Journal* of December, 1914, reports fifty-one cases, and says: "From our observations, both here and abroad, there is no reason

why *Dämmerschlaf* should not be given to all women who showed the physical signs of active labor, provided that the woman is under continuous and intelligent observation." In the same journal Humpstone concludes from twenty cases that Twilight Sleep is a scientific possibility in 90% of cases, but it requires a hospital and a specialist, and those who wish to use it must study under those who are already acquainted with the method.

In *American Medicine* of December, 1914, Hilkowich reports 200 cases from the Jewish Maternity Hospital of New York, some of which had already been reported by Rongy. He, too, strongly approves of the method and advises further work with this treatment.

American Medicine for January, 1915, contained a symposium of articles on this subject by the following men of Greater New York: Wainwright, Brodhead, Knipe, Hellman, Boldt, Beach, Waldo, Rongy,

Heller and Bandler. Brodhead reports twenty-one cases, in which he and Stein used the Siegel method. Knipe added one case to his series and Beach reported fifty cases. All except Bandler are more or less enthusiastic about the method. Another article by Knipe, in *The Modern Hospital*, added nothing new to his previous reports. The February, 1915, *American Medicine* contains an article on the subject by F. W. Whitney. He adds spartein to the other drugs, with very favorable results. This addition of spartein is unnecessary.

Late in January, 1915, there was a discussion on Twilight Sleep under the auspices of the Chicago Medical Society. Polak there reported 175 cases, and concluded that the method is primarily a first-stage procedure, that it lessens operative interference, that it can be used without danger, but should be employed only in hospitals. Schloessingk, of Freiburg, without giving details, also spoke in favor of

the method. Frankenthal and Baer reported thirty-nine cases with the following results: Thirteen no success, five very little, seven partial, four fair, seven good, and three where the success was complete. Wakefield, of San Francisco, at this meeting reported forty cases, and is convinced of the tremendous value of the procedure, and says that he would as soon consider performing a surgical operation without an anesthetic as conducting a labor without scopolamine amnesia. He has discarded the memory test and simply uses his general observations of the patient. He says: "When the patient's expression begins to take on a keen look, like a child awakening from sleep, she was endeavoring to place herself and find her consciousness; when, furthermore, she begins to successfully correlate happenings, then she needs another dose."

Mosher has written an article in *The Kansas State Journal*, and another in *Sur-*

gery, *Gynecology and Obstetrics*. He tells of his visits to various institutions in the East where the method is in use, and adds four cases of his own.

Scadron reports 202 cases in the *Inter State Medical Journal*. Most of these cases had been reported elsewhere in the literature.

Philip J. Carter, in the January, 1915, *New Orleans Medical and Surgical Journal*, reviews the literature briefly, but adds no case of his own.

At the January meeting of the Gynecological Section of the New York Academy of Medicine, there was a special discussion on Twilight Sleep, in which fifteen members took part, all but one being more or less in favor of this treatment.

The Medical Times for December, 1914, had remarks by ten men interested in this work. These were not scientific discussions, simply short paragraphs containing expressions of opinion, and without case

reports. Polak, Knipe and Schloessing were most enthusiastic, whereas DeLee says that the drugs have inherent dangers and will cause unfortunate experiences. He claims that even in the hands of specialists there will be infant deaths and injured mothers. Hirst says that after trying the method when it was first recommended, and again more recently, he has given it up. Bell, Gellhorn, Applegate, Zinker and Bovee feel that it has a limited field, and should be used only in hospitals, and by specialists with plenty of assistants and correct technique.

Beach, before the Gynecological Section of the New York Academy of Medicine, compared 1,000 cases of scopolamine labors, collected from various sources, including some of his own, with 1,000 non-scopolamine labors at the Jewish Hospital in Brooklyn. The results greatly favored the scopolamine cases. In the discussion following his paper, Brodhead and Polak

spoke in favor of Twilight Sleep, Vineburg and Kosmak against it. Rongy, who previously had been a supporter of the method, spoke rather against it. He laid great stress on the fact that he had frequently seen persistent headache follow the treatment, and stated that the use of the drugs constitutes a definite danger to the baby. Brodhead mentioned that he had had 110 cases to date, and had seen no harm since he had replaced the Siegel method with Gauss's technique.

Leavitt, in *The American Journal of Clinical Medicine* for April, 1915, reports ten successful cases, in which he used morphine, hyoscine and cactine tablets. He says, "Twilight Sleep should not be administered at random," that the dose of hyoscine and morphine should be given cautiously and in minimum amounts, that the subject under its influence should be closely watched by an experienced attendant, and lastly, that all the other advan-

tages of environment and suggestion should be employed.

N. G. Green, who reported in the *Journal of the Medical Society for New Jersey*, January, 1915, had twenty cases. There was analgesia in all of them. Sixteen were somnifacient, ten had complete amnesia, five partial, and five slight amnesia. There were three forceps cases and two cases of pisiotomy. There was one case of nephritis with gastric irritation; the baby died three days later, with signs of subdural hemorrhage from a prolonged second stage, rather than from the two injections the mother had received. The majority of the babies were born in a semi-narcotic condition, which passed away without interference in about twenty minutes. In one, cyanosis persisted for twelve hours. After the delivery the mothers seemed rather exhilarated by the drugs than shocked by the labor, and the puerperium was unaffected.

C. E. Dakin, reporting in the *Iowa State*

Medical Society Journal for March, 1915, admits the need of producing analgesia in a certain number of labor cases. He tried hyoscine, morphine and cactine tablets, but found that there were so many asphyxiated babies and unpleasant results that he discarded the treatment.

Rongy, in his latest paper, read before the New York State Medical Society late in April, 1915, again speaks enthusiastically for Twilight Sleep, but lays emphasis on the fact that it is amnesia that is produced and not an absence of pain.

Gardiner, in the *Ohio State Journal* for April, gives a report of twenty cases from private practice, and says: "Experience with this technique leads the writer to the conclusion that in properly selected cases the memory of the event is obliterated and the pain and shock of childbirth reduced to a minimum."

The Journal of the American Medical Association for May 22, 1915, contains two

articles on Twilight Sleep, one by J. L. Baer, of Chicago, and one by W. E. Libby, of San Francisco. Baer reports sixty cases, and summarizes: "The prolongation of labor, the increase in the number of fetal asphyxias, the excessive thirst and intense headaches that are so distressing, the difficult control of patients and avoidance of infection by soiling the genitals, the more frequent post-partum hemorrhages, the blurred vision, the ghastly deliriums persisting far into the puerperium, the inability to recognize the onset of the second stage unless by risk of more frequent examinations, the masking of early symptoms, such as ante-partum hemorrhage, rupture of the uterus and even eclampsia, the violence and uncertainty of the whole treatment, the general bad impression given to our patients who are being taught to approach the horrors of labor in fear and trembling, constitute so severe an arraignment of this treatment of

labor cases that we feel compelled to condemn it, leaving open the question of the merits of a single dose of morphine and scopolamine in those cases in which we have hitherto given morphine and atropine."

Libby reports thirty-five cases, and says: "Physicians must recognize that the method has not reached the perfection which warrants indiscriminate use," and concludes: "The very satisfactory results in the majority of cases provides the stimulus to secure further improvements in the method which will broaden its field of application and remove its objectionable effect upon the new-born infant."

As can be seen from a study of this enormous mass of literature, Twilight Sleep is being tested all over the country, and those who have adhered faithfully to the Freiburg technique seem to be favorably impressed with its possibilities.

To get a clearer view of the position of

the profession on Twilight Sleep, about one hundred and twenty letters, containing a series of questions, were mailed to all Fellows of the American College of Surgeons who in the last year-book of that organization had signified their interest in obstetrics. Fifty answers were received. These came from all parts of the country and should be of some interest if reviewed in detail, though they prove little. Medical conservatism has caused all obstetricians to be guarded in their statements about a procedure that has received so much lay notoriety, but the majority express their belief that a perfected and safe painless childbirth would be of incalculable value. The questions were answered as follows:

1. Have you tried Twilight Sleep according to the scopolamine-morphine method of Freiburg? Twenty-six answered in the affirmative.

2. If so, in how many cases? The an-

swers gave figures from one to 250 cases.

3. Have you any intention of using this method in the future? Three of the men who had used it in a few cases did not think they would go further in their experiments. Two were in doubt. The other twenty-one who were using it were going to continue. Two of those who had not used it intended to try it.

4. Do you use any drug or method for allaying the pains of labor? Practically all answered yes, showing the need of some treatment, and that the suffering of labor is not entirely physiological. At times it requires alleviation.

5. If so, what drug or method? Morphine, ether, chloroform, chloral, antipyrine, nitrous oxide were all mentioned in answering this question.

6. Have you found any prolongation of the first stage of labor? If so, how much? This was answered as follows: Six said

it prolonged it; ten said it did not; two said it shortened this stage. The question was unanswered eight times. One man found it prolonged as much as 30% to 50%, and another said that no case was fully dilated in less than thirty-six hours.

7. Have you found any prolongation of the second stage of labor? If so, how much? Eighteen answered that it was lengthened, three of these say the lengthening was but slight. Six left this unanswered, and two thought it was not lengthened. My own views being that it was only lengthened after the head reaches the perineum.

8. Have you found any harm to the mother? (a) During labor? Fifteen found none; five thought there was harm, and six left this unanswered. The harm noted was that due to the need of early operative interference (forceps); the increased relaxation of the uterus; delirium at times. (b) During the puerperium? None who an-

swered this saw any harm during this stage.

9. Have you noted any harm to the mother's mentality? This was invariably answered in the negative, though some noted the temporary delirium which is occasionally met.

10. Have you noted any harm to the flow of milk? One man said he thought lactation was delayed. Another observer had seen one case where lactation gradually ceased, and the others saw no harm. Some believed it was benefited.

11. Have you noted any harm to the baby? This important question unfortunately remained unanswered by seven of the men testing the method. Six of the others saw no harm. Oligopnea, asphyxia and apnea were complained of, alone or in combination, by twelve. Two observers had each seen a stillbirth which they thought due to prolonged labor, the drugs and forceps. One man narrated two deaths

on the fifth and eighth days, respectively, one a defective with closed fontanelles, and both showing hemorrhages suggestive of asphyxia.

12. Do you consider the method applicable in the home? The answers show that it is the general impression that hospital conditions are essential; but that when these can be produced in the home then Twilight Sleep can be used there.

13. *General Remarks.* This was variously answered, and a few of the replies will tend to show the differences of opinion at present existing:

One not using the method says: "No one should use morphine-scopolamine unless he has the opportunity to observe its use and thoroughly familiarize himself with the technique in a hospital of known reputation, with obstetricians skilled in its application. From what I have read am of the opinion the method is far from perfect, and is applicable only in selected cases,

and in hospital practice. In routine cases it seems to me it is attended with too many serious complications."

Another says in part: "My basic objection to scopolamine is owing to the fact that hyoscine is not a single definite chemical compound, but belongs to the stereoisomerides, and that among 'hyoscines' it is difficult to distinguish the more toxic from the less toxic, perhaps impossible, by the means hitherto employed."

Some other answers were: "Am heartily opposed to 'Twilight Sleep.' It was tested out ten years ago and condemned."

"Not practicable for general practitioner. Only practicable in hospitals."

"In my private practice I have never found a patient who has dreaded a second confinement simply on account of the pains of labor."

Among the answers to Question 13 of those who had used Twilight Sleep were the following: "I do not consider Twi-

light applicable in the home unless the attendant is, first, a trained obstetrician; and, second, is willing and able to devote his whole time to his patient, it may be for twelve hours or longer, keeping constant watch of the fetal heart and ready to operate if it shows any marked change."

Another says: "My experience with the treatment at home is decidedly less than that in the hospital, but from my combined knowledge in the few cases stated, leads me to believe that Twilight is desirable in most cases, especially primiparæ." And later: "The more one uses the treatment the better it works; the better one is able to judge as to dosage, the more favorable the results, and the more enthusiastic one becomes as to its general benefits."

Here is an unusual one: "I was unfavorably impressed with the Twilight Sleep treatment in 1907, and consequently approached the subject in September, 1914, with a prejudiced opinion. Now I am en-

thusiastic. I think the reason of failure in 1907 was because I allowed the treatment to be employed by internes in the hospital. I now give it my individual attention as much as possible. I believe the treatment has come to stay. We have much to learn about it yet, and no one should undertake it unless he is willing to give the time at a personal sacrifice to master the details. I believe it will result in specializing obstetrics. I can report no unfavorable results except temporary."

Still another says: "My limited experience leads me to believe that in certain selected cases in primiparous women in whom the dread of pains is little short of an obsession, the advanced assurance that their pain will be relieved is a very important feature."

Another: "I do not consider that Twilight Sleep in any way comes up to the statements made concerning it in the lay press."

And finally one says: "These drugs, I think, are dangerous; they certainly produce asphyxia of the new-born, and in the hands of the general practitioner will certainly produce much havoc."

VII

SOME THEORETICAL CONSIDERATIONS OF TWI- LIGHT SLEEP

FROM the earliest days of medicine and surgery theories of the causation of shock and attempts to allay the same have been numerous. Crile wrote, in 1913, in an article on "*Shock*": "Let me at once state my principal conclusion, that all forms of shock are caused by over-stimulation and consequent exhaustion; that the brain-cells show physical changes, corresponding to each stage of the cycle of shock, and that with each shock-producing agency which I have studied there is shown in the brain-cells a hyperchromatic stage followed by a hypochromatic stage." In this article he also states: "Anesthetics and the narcotics cause neither brain-cell changes nor

increased epinephrin output." In an article on anoci association, he says, "Psychic strain may have deleterious effects," and, "The use of a local anesthetic is to interrupt the passage to the brain of traumatic stimuli from the field of operation."

Though Crile's theories may not seem to fit every case, and may not be perfect, they certainly are of great value as a working formula for the prevention of shock in labor. If pain and other unpleasant sensations ("nocuous influences") are allowed to travel along the sensory nerves so that they are eventually perceived by brain-cells, causing *hyperchromatism* and then *hypochromatism* and permanent damage of the cell, shock is produced. We must attempt to break this line of connection between the shock-producing agent and the brain-cell at some place where we will do no harm and not interfere with the physiological progress of labor. The blocking agent must not be more dangerous than

the shock itself. Sensory depressants fulfill the first condition and the sensory depressants, scopolamine and morphine, are reasonably safe, and act as a mild anesthetic, allaying the susceptibility of the brain. By blocking the painful sensations and making the mother oblivious to her surroundings, and preventing the chromatic changes which lead to the injury of the cells, these drugs tend to lessen shock.

Of less importance, but also of interest as abstract considerations are the following: The emotion fear, so often present during the later months of pregnancy, probably has a harmful influence on mother and child. If the mother feels that she is not going to face an ordeal, but simply going into a sleep during which her child will be born, there must be a cheerful prenatal influence which should be advantageous.

The absence of the fear of labor prom-

ises to increase the birth-rate when Twilight Sleep is generally used. We all recognize that in a certain proportion of cases fear of childbirth has been the determining factor in the prevention of conception, or the production of abortion.

Another advantage to be expected from Twilight Sleep is the placing of the art of obstetrics on a higher and more dignified plane. Only the man who is especially trained will be able to give the patient this treatment, and as he will have to devote much more time and give more attention to the patient, we can expect to see in these cases a decreased percentage of the accidents that are now caused by the lack of this expert care.

Finally, it may lead to the establishment of more well-equipped institutions for the care of the parturient woman. In these institutions, any reputable physician should be allowed to attend his patient, and there should always be at hand, in ad-

dition to modern equipment and the necessary assistants, a skilled resident trained in the various methods of painless childbirth.

VIII

CASE REPORTS WITH STATISTICS

THE sudden lay notoriety which Twilight Sleep received in the summer of 1914 naturally made the medical profession in America very skeptical. At this time the Charité, at Berlin, was still dominated by the views of its former chief, Prof. Bumm, and the work of his assistant, Hocheisen. There it was felt that the method had been fully tested, that Freiburg would not show the work it was doing, and that there must be some inaccuracy in the reports. A visit to Freiburg soon dispelled all skepticism, and produced an enthusiasm for *Dämmer Schlaf*. How it could best be applied elsewhere was the problem that remained to be solved.

The number of cases here reported,

though not large, should be of value simply because they were carefully studied. It is important to preface these statistics with the statement that with the exception of the few cases where operative interference became necessary, the deliveries were made by the internes, and I was rarely present. The dosage was largely regulated by them, though I supervised as much as my time and the telephone would allow. The earlier cases received narcophine gr. $1/2$, and scopolamine gr. $1/150$, and occasionally the narcophine would be repeated in smaller amounts with scopolamine, the latter being in succeeding doses about $1/450$ of a grain. Various preparations were tried, but the solutions were always freshly prepared by our own druggist, and we came to the conclusion that Straub's method was the best. Toward the end of our series we used morphine gr. $1/4$ with the initial dose of scopolamine. We never repeated the morphine.

We admitted to the obstetrical wards at Lebanon Hospital, from Oct. 9, 1914, to Feb. 1, 1915, 202 cases, of whom 127 had no scopolamine, and nine had only one injection. Sixty-six cases (32%) had two or more doses. It will be interesting to pause for a moment and see why so large a number were not treated by this method, when we were all so anxious to form an opinion based on as many cases as possible. Of the 127 cases that had no treatment, sixty-four were delivered less than three hours after admission, eight received antalgine, six though admitted were not in labor, and twelve showed complications. The complications were eclampsia in two cases, prematurity in six cases, acute hydramnios, vomiting of pregnancy, pyelitis, failed forceps before admission, each one case. That the remaining thirty-seven cases did not receive scopolamine was due to the fact that the men on the house staff who had this work in charge were too busy with

other duties to give the patients the necessary close attention. These figures clearly show that though the number not receiving this treatment can be reduced when we are able to increase the number of internes or build more institutions where Twilight Sleep can be properly administered, there will always remain a considerable percentage of cases that, because of rapid delivery, or not presenting themselves in time, will be deprived of the advantages scopolamine can give. The best that can be said of this is that these are probably the cases that need it least.

It will be interesting to bear in mind that the following complications arose among the cases not receiving scopolamine and morphine, and compare them with the complications of the Twilight Sleep cases. There were sixteen (11.86%) lacerations of the perineum, seven (5.145%) post-partum hemorrhages, none of which was severe, and none of which required more

than uterine massage; there were three (2.205%) forceps cases. Once the placenta did not come away until more than forty-five minutes had elapsed, and one case required manual extraction. There were ten (7.35%) stillbirths, including, of course, the premature infants, and those that were dead on arrival. In only five out of the eight antalgine cases was there an oligopnea. In no instance was there any asphyxia. There was no asphyxia of the baby and no oligopnea, except in five of the antalgine cases.

In the sixty-six scopolamine cases the largest number of injections was eighteen. This was in an entirely normal delivery, and the child breathed spontaneously. Thirty-five of the cases were primiparæ, nineteen were para two, three para three, four para four, one para seven, two para eight and one para nine. Amnesia was complete in forty-five (67.95%) of our sixty-six cases. It was partial in nine

(13.59%), and there was no amnesia in twelve (18.12%). In the twenty-one cases where the amnesia was not complete there was marked analgesia in eighteen (85.68%), slight analgesia in two (9.52%), and only one case seemed in no way benefited by our efforts. There was a certain amount of restlessness in a few cases, but only in two did this become annoying. The forceps were applied six times (9.06%), three times because of delay of the head on the perineum, once for clinical instruction, once because the mother was extremely restless, and once because the fetal heart-beats suddenly rose from 120 to 170. The perineum was lacerated eleven times (16.61%). In two cases there was post-partum hemorrhage (3.03%), easily controlled by massage. In one case the placenta did not come away for forty-five minutes and in another for one hour. But in no case was manual extraction necessary. The only other complication seen

in the mother during her entire stay in the hospital, was that six complained of severe thirst, two of these developing an herpetiform eruption of the mouth and throat.

Our sixty-six labors resulted in sixty-seven babies, of whom fifty-six (83.44%) breathed spontaneously, eight (11.92%) were born oligopneic. The second of the twins came forty-five minutes after the first. It was very much asphyxiated, and, though temporarily revived, it died the next day. There were two (2.98%) stillbirths; one following version, which broke the child's neck; the other was a premature infant, in whom there were no fetal heart sounds, and meconium was coming away on admission. One of the oligopneic babies had difficulty in nursing for about a week, and then did very well. The babies did at least as well as the non-scopolamine cases, and their mothers recovered more rapidly, without the shock of labor, having been given the advantages of analgesia and amnesia.

A FEW SPECIMEN CASES

Mrs. L. W. Primipara, vertex presentation, received seven injections; a small tear of the perineum required one stitch; the baby breathed spontaneously; placenta came away in fifteen minutes. The mother did not know of its birth until informed by her own mother, who visited her six hours later.

Mrs. I. I. Para one, vertex presentation, very noisy on admission, received two doses. Twenty minutes after the first injection she became quiet. She was in the hospital only three hours and forty-five minutes when the child was born. There was no tear. Placenta came away in twenty minutes. The baby breathed spontaneously. There was no amnesia but marked analgesia.

Mrs. S. R. Para two, vertex presentation, received five injections. She was quiet between the pains, but restless when

they occurred. The baby was oligopneic for five minutes. The perineum was intact. She remembered only the first injection. She had perfect amnesia, but complained of a herpes of the throat as a result of thirst during labor.

Mrs. P. Para two, breech presentation, received five injections. She was asleep between the pains. She did not remember being transferred to the operating room for final delivery of the after-coming head. There was no tear of the perineum. The placenta came away in twenty minutes.

Mrs. G. Para one, vertex presentation, received only two injections. She felt the child being born, asked for it, but insisted that she had no pain. Placenta came away in fifteen minutes.

Mrs. M. Para one, vertex presentation, received eighteen injections. She was so restless as to make asepsis difficult. Amnesia was perfect. The child breathed

spontaneously. The placenta came away in fifteen minutes. There was no tear.

Mrs. A. F. Para nine, vertex presentation, received nine injections, sleeping most of the time; thirsty when awake. She did not know of the birth of the child. It breathed spontaneously. There was no tear, and the placenta came away in fifteen minutes.

Mrs. R. W. Para one, was so restless and tried so hard to get out of bed, and was so excitable that she could not be controlled, so that after two injections the treatment had to be discontinued. There was no amnesia and no analgesia.

One patient, whose child had been born about midnight, asked the day nurse when she came on duty if she would not send for the doctor, because the day before she had felt life, and now felt none. In other words, she was not aware of the birth of her child over seven hours after delivery.

Still another patient, a very successful

case, was very much enraged, because she had not wanted Twilight Sleep. She and the baby left the hospital perfectly well. She had given written permission, evidently without understanding what was to be done. This case shows that it is the drugs that do the work, and not any particular receptive mental attitude of the patient.

IX

OTHER METHODS OF PAINLESS CHILDBIRTH

WE will consider here only such methods of painless childbirth as are now being discussed in medical literature. We will, therefore, not consider chloroform, ether or nitrous oxide in labor, for their relative values are now generally accepted. Individual doses of opium, or any of its derivatives, such as morphine, pantopon, or narcophine, used in this manner, though frequently of great value in giving relief, cannot be considered methods of painless childbirth. Hypnosis, chloral, cocaine (local and intraspinal), stovaine, and a host of other therapeutic measures, have been tried and either discarded, or reserved for use in exceptional cases.

The typical Twilight Sleep is described

in the chapter, "The Freiburg Technique." Two variations of it are now being tested by the assistants of Kroenig in the wards of the Freiburg Frauenklinik. One is simply the substitution of narcophine for morphine. Narcophine is a recent combination of morphine with narcotine, held together by meconic acid. Meconic acid also exists in opium and is inactive. Narcophine rapidly deteriorates and must have some preservative added to it. It is supposed to be less dangerous than morphine, and by many believed to be less potent.

The other method now being tested is named after Dr. Siegel, one of Kroenig's younger assistants, who is in charge of the investigation. Its object is to simplify the technique of Twilight Sleep, dispensing with the necessity of the most careful watching and the use of the memory test, by administering definite doses at definite times. The treatment is started at about the same time as the regular method. The

First injection,		1.5 c.c. scop. and 1 c.c. narc.=0.00045 scop. and 0.03 narc.
¾ hours after first,		
1½	" "	1.5 c.c. " =0.00045 scop.
3	" "	.5 c.c. " and 0.5 c.c. narc.=0.00015 scop. and 0.015 narc.
4½	" "	.5 c.c. " =0.00015 scop.
6	" "	.5 c.c. " =0.00015 scop.
7½	" "	.5 c.c. scop. and 0.5 c.c. narc.=0.00015 scop. and 0.015 narc.
9	" "	.5 c.c. " =0.00015 scop.
10½	" "	.5 c.c. scop. and 0.5 c.c. narc.=0.00015 scop. and 0.015 narc.

injections are given according to the table (page 146) devised by Dr. Siegel.

With the birth of the head he uses a small quantity of ethyl-chloride. He has administered as many as twenty-seven injections, and gives primary inertia and narrow pelvis as the only contra-indications to the treatment. In 220 successive cases he had 88% complete amnesia, 10% partial, and 2% were unaffected. The amnesia usually started after the third or fourth injection; when the child was born prior to this the results were unsatisfactory. Of the 220 children 67.6% breathed spontaneously, 27.7% were oligopneic, 1.7% apneic; 1.7% were born asphyxiated, half of them dying; 1.3% were still-born.

During the summer of 1914 visitors to the clinic, most of whom saw only this method, noticed that it occasionally took thirty minutes to revive some of the oligopneic infants.

In the entire realm of medicine thera-

peusis demands individualization, and certainly when dealing with such drugs, and where the idiosyncrasy may be so pronounced, a method like the Siegel method will often lead to the greatest trouble. Twilight cases require the closest care on the part of the obstetrician, and the suggestion that there is a method which could be safely left in the hands of an untrained assistant is very dangerous. The advice to give another dose of scopolamine, or this combined with narcophine, just because the hands of the clock have moved a certain distance, without considering whether the fetal heart sounds are what they should be, or whether the mother is still sufficiently under the influence of the last administered dose, seems hardly worthy of serious consideration. Surely, widespread use of the Siegel method would soon bring Twilight Sleep into disfavor by causing frequent fatalities.

In 1896, in a discussion of painless child-

birth at the Congress of Russian Physicians, Savitsky stated that for seventeen years he had been using antipyrine per rectum. He gave fifteen grains, and sometimes added from fifteen to twenty drops of tincture of opium. When two hours had elapsed, the dose was repeated if needed. He claims that it is of special value in cases of uterine tenesmus, and when the os is rigid. The results are seen in from fifteen to twenty minutes, and he claims never to have had any harmful results. The questionnaire which is found in another chapter brought out the fact that a prominent obstetrician in New York always used this method with satisfaction. No detailed reports exist in the literature.

Dr. M. W. Kapp, of San José, California, reports excellent results from the hypodermic injection of heroin (another alkaloid derived from opium) gr. 1/12. The effect of one injection, he says, lasts

about three hours. When the analgesia has worn off he repeats his treatment, using $1/24$ or $1/36$ of a grain. If the patient is never under the influence of more than gr. $1/12$ at one time, the sensory nerves are inhibited and the motor nerves not affected. He has used it in about 100 cases, and has seen no harmful results in mother or child. He believes that heroin rather hastens than retards labor, and that it causes no post-partum uterine atony. He is convinced that it lessens the shock of labor.

In July, 1914, Prof. Ribemont Des-saignes, of the French Academy of Medicine, reported 112 cases in which he had used a drug known as antalgine obstetrique, recommended to him by the chemists Paulin and Laurent. This drug is supposedly obtained by the action on chlorhydrate of morphine of living ferments resembling beer leavening, but shows none of the characteristics of morphine. When

used in labor antalgine acts on the brain and sympathetic centers without noticeable effect on the spinal cord. Entire cessation of pain is effected in a few minutes. In eighty-four of his 112 cases there was complete analgesia, in twenty-four the analgesia was marked, four patients claimed that they had no relief, though their screams became less violent. The analgesia lasts from one-half to twelve hours. Sixty-three of his cases needed only one injection. In thirty-nine the pain returned at the end of five hours, nine received three injections, and one case five injections. There was one case of post-operative hemorrhage. The third stage averaged thirty-two minutes. There were no complications and the patients were not exhausted. These 112 labors resulted in 115 babies, of whom seventy-seven cried out at once. Twenty-eight seemed dazed and were apneic, but after a few minutes breathed with perfect freedom, and were comparable to

Cæsarian babies. There was one fetal death during labor, the fetus already doing poorly at the time of admission to the hospital. Two babies had convulsions shortly after birth, autopsies showing meningeal hemorrhage. Three premature children died at the end of one, two, and eleven days. All the others left the hospital in perfect health.

In the discussion of this paper Pinard, of the Beaudelocque, said that his results confirmed those of Prof. Dessaignes. They advised the use of 1.5 cc. for the first dose, and 0.5 cc. for succeeding doses. This drug has been variously condemned, especially by *The Journal of the American Medical Association*. It is sometimes claimed to be nothing more than morphine in solution. I have tried it in eight cases, and find that it has powerful analgesic properties, but it seems to delay the labor. Though I have used smaller doses than those recommended by the French obstetri-

cians, five of the babies were born apneic. None of the patients showed any symptoms such as are seen after the administration of small or large doses of morphine. In a ninth case, where I used a similar but not identical preparation,* which is recommended for pre-anesthetic surgical use, the patient had a sharp collapse, coming on ten or fifteen minutes after the injection. The collapse in no way resembled morphine poisoning. The patient revived in about an hour. This drug may not fill the needs of painless childbirth, but the last word as to its value has not yet been heard.

Weinman, who tried chloroform, aspirin, sacral anesthesia, and intranasal injections of cocaine, found them all of only moderate value. He then tried pantopon, with and without scopolamine. He reported forty cases, of which twenty-four

* Antalgine surgical—the morphine supposedly not entirely removed.

had pantopon alone, eight had one dose of pantopon with scopolamine and eight had two injections of the combination. The injection of pantopon consisted of 1 cc. of a 2% solution, and showed its effects in from fifteen to thirty minutes. In three cases, when the pantopon was given too late, there was no result. In eight cases the analgesia was moderate, and in sixteen considerable. In three cases, a second dose of pantopon was needed, and gave great relief. In five cases, where the pantopon was of little value, a second injection was given of pantopon and scopolamine, with brilliant results. In two cases that received the combination from the start the absence of pain was marked. Weinman saw no complications in the mother and no harm to the child. He concludes that when treatment is needed only at the very end of labor he prefers "Chloroform à la reine," and when required during the entire labor he prefers pantopon alone, or if

the pains are very severe, pantopon with scopolamine.

Jaeger also used pantopon instead of morphine with scopolamine. He had thirty cases, of which only two were not satisfactory. Von Deschwanden had nine cases with this combination. Both of these observers found the treatment safe for mother and child and valuable in producing analgesia.

None of these methods has as yet been sufficiently tried to allow of a definite conclusion as to their value or to warrant their general adoption.

X

CONCLUSIONS

THE review of the literature and the history has shown that we can for convenience divide the subject of scopolamine and morphine in obstetrics into three periods. The first or analgesic period, from Steinbuchel's original article to Gauss's memorable contribution. During this period the experimenters frequently made only one injection, and were content with allaying a certain amount of pain, in other words, producing some analgesia. The second or amnesic period starts in 1906, and all experimenters during the following years considered the work of Freiburg to a greater or less extent. Unfortunately they did not all follow Gauss's instructions, and therefore did not meet with as satisfactory

results as those of Freiburg. These observers, too, were frequently satisfied with analgesia, but in studying their work we see that in general they knew that amnesia was most desirable. This period included the controversy between Freiburg and Berlin. During this time observations were made in Germany, Austria, Russia, Poland, Switzerland, France, Great Britain, Canada and the United States. The third period starts late in the summer of 1914, and is strictly an American period. Freiburg technique is the criterion, but for obvious reasons, most of the work is being done here. Amnesia is sought, either alone or in combination with analgesia.

All these observations should help us to decide definitely the value of this treatment as it can be applied in America. The natural differences between the larger and smaller cities will cause divergence of opinion and variation of detail, but when

all the experiments are well advanced conclusions can be drawn. This experimental stage is not to decide the value of scopolamine and morphine in obstetrics as applied in Freiburg, for if we believe the reports from that clinic, and there seems to be no reason to doubt them, we cannot but agree that for that quiet little town, and with a Gauss in continual residence, the method is perfect.

American conditions are different, and men of Gauss's caliber are rarely doing resident duty, and that, unfortunately, must remain one of the main reasons for questioning our ability to apply Twilight Sleep in America. Here, for the masses, the more or less incompetent male or female midwife does a large proportion of the obstetrics, and this class is hardly fitted to decide the depth of an amnesic state. The man with a large general practice, though with considerable obstetrical ability, will not have the necessary time to

give each individual case. Even the specialist will not always have the time to devote day and night to such work. The hope of establishing in every community sufficient Twilight hospitals, so that every woman can be delivered therein by her own physician, and the semi-anesthesia regulated by a resident expert, is too Utopian to be looked for in the near future. Of course, if even only a few of these hospitals were constructed, the number of women helped would be considerable.

Any effort to make all deliveries painless is at present out of the question. All those performing deliveries will not and cannot be forced into developing the ability and giving the time necessary for this work. Furthermore, there is a certain definite percentage of cases, especially in multiparæ, where the entire course of labor is too short to allow the drugs to accomplish very much. It must be admitted that these women are not, as a rule, those who

most need the treatment, but some of them, though suffering only a short time, suffer tremendously. They will either have to be left to their sufferings, or something new that acts more quickly will have to be found.

The practicability of continued gas anesthesia, though of undoubted value, at times is very limited. It involves all the expense of time, plus the not inconsiderable cost of gas, and requires two experts instead of one. My view is that we will find after several hundred thousand cases have been treated in this country that the women of America who feel that they need this treatment will be able to have it capably given them in every part of our land, and that they will no longer have to travel to Freiburg to have their babies. Many women will feel that their nervous energy is well able to stand the strain of ordinary labor, and will not want to go to the necessary expense of having

a trained man devote his entire time to them during parturition. The general practitioner, though not wishing to give sufficient time to the work, will no longer denounce the method as dangerous, for its safety will have been proven. The specialist in obstetrics will have to add to his other armamentarium scopolamine and morphine and so arrange his work that he can make this sacrifice of time in the interest of his patient, just as he makes other sacrifices daily.

Finally, we can say that under proper surroundings and under proper conditions and in properly selected cases this treatment is ideal. Conducted along the lines laid down by Gauss, it is absolutely safe for mother and child.

Until some better and more easily manipulated treatment is devised, the technique outlined here will be the method of choice for alleviating the pains of childbirth.

SPECIMEN CHARTS

SCOPOLAMINE AND MORPHINE DURING LABOR.

Hospital.....	History No.....	
Name.....	Address.....	Age..... Para..... Month Gestation.....
Family and Personal History.....		
Previous Pregnancies, Labors, Puerperiums.....		
AT FIRST INJECTION. Time of.....		Time of onset of Labor.....
Blood Pressure.....	Pulse.....	Respiration..... Skin..... Fetal Heart.....
Dilatation.....	Frequency and Duration of Contractions.....	
Doses.....	Membranes.....	Condition of Patient (<i>restless, quiet</i>).....
Effect on Patient (<i>amnesia, anaesthesia</i>).....		
Effect on Contractions.....		
AT SECOND INJECTION. Time of.....		
Blood Pressure.....	Pulse.....	Respiration..... Skin..... Fetal Heart.....
Dilatation.....	Frequency and Duration of Contractions.....	
Condition of Patient (<i>restless, quiet, amnesia, anaesthesia</i>).....		
Doses.....		
Effect on Patient.....		
Effect on Contractions.....		
AT THIRD INJECTION. Time of.....		
Blood Pressure.....	Pulse.....	Respiration..... Skin..... Fetal Heart.....
Dilatation.....	Frequency and Duration of Contractions.....	
Membranes.....		

Condition of Patient (*restless, quiet, amnesia, anaesthesia*)

Doses.....Effect on Patient.....

Effect on Contractions.....

AT FOURTH INJECTION. Time of.....Pulse.....Respiration.....Skin.....Fetal Heart.....

Blood Pressure.....Frequency and Duration of Contractions.....

Dilatation.....Membranes.....

Condition of Patient (*restless, quiet, amnesia, anaesthesia*).....

Doses.....Effect on Patient.....

Effect on Contractions.....

Other anaesthesia and Drugs.....

Termination of Labor (*Spontaneous, Instruments*).....

Duration of First Stage.....Second.....Third.....Total Duration.....

CHILD.

Condition at Birth.....

Respiration (*normal, asphyxia, oligopnea*).....

Placental Delivery.....General Remarks.....

Condition of Mother and Child 24 hours after Delivery (*Memory of Labor*).....

Delivered by Doctor.....

DR. J. CLIFTON EDGAR
28 West 56th Street, New York

JEWISH MATERNITY HOSPITAL,

270 E. BROADWAY, NEW YORK.

SCOPOLAMINE, NARKOPHEN, TWILIGHT SLEEP.

MOTHER.

Name.....Address.....

Single.....Married.....Age.....Children.....Miscarriages.....

Obstetrical findings before the injection.....

.....

.....

.....

Pulse.....Color.....Respiration.....Fetal Heart Sounds.....

Time of onset of labor pains.....Duration of labor pains.....

Frequency of labor pains.....Blood pressure.....

TIME OF THE FIRST INJECTION.....Doses.....

Pulse.....Color.....Respiration.....Fetal Heart Sounds.....

Frequency of labor pains.....

Durations of labor pains.....Restless.....Quiet.....

TIME OF THE SECOND INJECTION.....Doses.....
Pulse.....Color.....Respiration.....Fetal Heart Sounds.....
Frequency of labor pains.....
Duration of labor pains.....Restless.....Quiet.....
TIME OF THE THIRD INJECTION.....Doses.....

CHILD.

Time of Birth.....Asphyxia.....Oligopnea.....Normal.....
Separation of the placenta.....Total duration of labor.....

Delivered by Dr.....

General remarks.....

General condition of the patient on the following day.....

.....
.....

TWILIGHT SLEEP IN LIGHT, MEDIUM, DARK ROOM.

Address.....	Para.....
--------------	-----------

A record on this form should be made at the time of each injection.

CHARTS FOR RECORDING DETAILS OF LABOR.

TWILIGHT SLEEP IN LIGHT, MEDIUM, DARK ROOM.

No. Age

Name Date

Address..... Para.....

	Success complete.	Partial.	Failure.	Compli- cations.
COURSE OF LABOR: Examinations Rupture membranes Interference Bearing down pains				
PAINS: (a) How strong? (b) How long? (c) How frequent?				
ABDOMINAL PRESSURE: (a) Good? (b) Medium? (c) Poor?				
FETAL HEART PULSE BREATHING TEMPERATURE				

A record on this form should be made at the time of each injection.

BIRTH OF CHILD (time).....

Spontaneous (Operative by.....)

Rupture membranes..... Position.....

Preparation

CONDITION OF CHILD immediately after birth:

Respirations, spontaneous.....

Asphyxia, light, deep.....

Oligopnea, deep apnea.....

Stillbirth, macerated.....

Artificial respiration by.....

CONDITION OF MOTHER during birth of head:

(Apparently) clear recognition.....

(Apparently) light cloudy recognition.....

(Apparently) in mild (deep) twilight sleep.....

In very deep twilight sleep, reflexes lost.....

BIRTH OF PLACENTA:

Spontaneous, by abdominal muscles and uterus.....

.....

By light pressure.....

By Credé (with) without anesthetic.....

By manual separation.....

Without bleeding, with slight, moderate (very) severe
bleeding, before, with, after birth of placenta.....

.....

Amount of blood lost.....

TEMPERATURE, pp:.....

PULSE, pp:.....

REMARKS

.....

.....

With ethyl chloride, chloroform, ether intraspinal.....
.....
With (without) slight expression of pain.....
With moderate (very) marked expression of pain.....
CARE OF CORD:
Clamped with (without) tying.....
Long, short, dressing.....

CRITIQUE OF TWILIGHT SLEEP.

I. SUCCESS.....
II. PAINS: 1st stage.....
III. PAINS: 2d stage (especially abdominal).....
IV. POSTPARTUM HEMORRHAGE.....
V. CONDITION OF NEW-BORN.....
VI. COMBINATION OF DRUGS USED.....
VII. SPECIAL REMARKS.....
.....
.....

TWILIGHT SLEEP RECORD.

Dr. A. M. HELLMAN.

No. Name Address
 Age Para Time of onset of labor
 Record of previous pregnancies
 Obstetrical findings before treatment
 Pulse Respiration Fetal Heart Sounds
 Frequency and duration of labor pains
 Blood pressure

BIRTH OF CHILD.

Time Position
 Manner of birth Spontaneous Operative
 Anesthetic Pituitrin
 Condition of child at and immediately following birth:
 Normal Oligopnea Asphyxia
 Remarks

THIRD STAGE.

Separation of Placenta Time
 Spontaneous Credé Light pressure Extraction
 Bleeding Slight Normal Excessive

Complete duration of labor.....
 Condition of perineum.....
 Delivered by Dr.....

RESULTS.

Amnesia.....Complete.....Partial.....Absent.....
 Analgesia.....Complete.....Partial.....Absent.....
 Condition of mother and child 24 hours after labor.....

*RECORD OF INJECTIONS.

No.....	Drug and Dose.....	Time.....
Pulse.....	Pupil.....Color.....	Respiration.....
Spinal reflexes.....	Fetal heart.....	Thirst.....
State of amnesia.....		
Test used.....	Quiet.....	Restless.....Delirious.....
Analgesia.....		
Remarks as to progress of labor.....		
Frequency and duration of pains.....		

** This form should be a separate sheet, to insure sufficient space for the recording of each injection.*
 Dr. Hellman's charts are for sale by Paul B. Hoeber, 67-69 East 59th Street, N. Y.

CUMULATIVE
BIBLIOGRAPHY

This bibliography is complete to June, 1915. Abstracts of new literature on this subject will be supplied by the publisher, from time to time, in a form convenient for pasting at the end of the present bibliography.

Those desiring these additional abstracts should sign and mail to the publisher the card accompanying this book.

THE AUTHOR.

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